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Editorial

OUR COVER THIS MONTH NEEDS NO EXPLANATION. Everyone has seen the Moon either with the naked eye, assisted vision, or through an astronomical telescope as depicted. For eons it has hung in the sky, a thing of mystery and perpetual challenge. In part the mystery has been dissipated, but the challenge remains. It is somewhere new, somewhere strange, a place which men have not yet reached. That, in itself, is enough to urge men to reach it.

There are many such challenges. Some have been denied as representing challenges at all; the psychic powers are a good example of this. For centuries inexplicable phenomena have been dismissed with cliché arguments and mental blindness. The mystics who tried to find a logical explanation for such manifestations only made matters worse. They could give their reasons, but those reasons were hopelessly incomprehensible to everyone, including the mystics. The words they used were meaningless sounds; they were, and in many cases are, in the position of a man who tried to invent a word for radio before wireless waves were even thought of. Any such word then invented was meaningless. Any word invented to describe the motivating force of levitation must be equally so.

Calling the psychic powers psionic powers helps to a certain degree because we have reached an agreement on what we mean by "psionic." They are powers of the psi, the mind, effects obtained without the use of machinery or, at least, without the use of other than the organic machinery we all possess. Mere possession does not mean that each can utilize his equipment in the same way any more than possession of muscles can enable everyone to lift the same weight. We all have lungs, a larynx and a tongue. We are not all good singers.

Hypnotism is a fact; people can be and are hypnotised. Yet for centuries hypnotism was denied as a fact at all. It was denied because people simply refused to believe such a thing possible, and all manifestations of hypnotism were

attributed to witchcraft, the "evil eye," unknown powers, etc. The powers weren't unknown, merely misunderstood. Even now hypnotism is not wholly understood, but at least it is not denied and is the subject for research. It is now, in effect, an accepted challenge.

Faith healing is a fact; the records at Lourdes leave no argument. How or why a person can be cured by faith when modern medicine has failed is still an open question. Those so cured do not usually worry about it, they know. They had faith, they were cured; to them it is as simple as that. But how can they ever convince others who do not know what faith is? You cannot teach faith, it must come from within.

Telepathy, clairvoyance, levitation, teleportation, telekinesis, all the odd and unusual phenomena which have existed in greater or less part throughout history and have always been denied are similar challenges. The evidence that these things exist is there. In any other field such a weight of evidence would have long ago resolved them into acceptable challenges but, for some reason, men fear to venture into the one place they cannot see: the human mind. It is an unfortunate fact that we know less about the workings of the mind than we do of the conditions on the surface of the Moon.

Because we can see the Moon, study it, examine it and talk about it as something quite outside of ourselves. It is an inanimate object which we can accept or leave alone. The mind isn't like that. We live with it, deal with it and it is something intensely personal. And we live in a society which places a high regard on personal privacy.

But the challenges are there and they will, eventually, be recognised. Once that happens, then the mystery will tend to dissipate. The terminology of the mystics will be replaced by meaningful sounds and, using those sounds, communication between research groups will be possible. But first the challenge must be recognised and accepted. Just as the challenge of the Moon has been recognised.

For it is a safe prophecy to state that someone now living will be the first to reach the Moon.

E.C.T.



JOHN MORTIMER

FULFILLMENT

by A. E. van Vogt

IF A COMPUTING MACHINE GREW SO COMPLEX THAT
IT GAINED SELF-AWARENESS, WHAT WOULD IT DO?
AND WHAT WOULD MEN DO?

I SIT ON A HILL. I HAVE SAT HERE, IT SEEMS TO ME, FOR all eternity. Occasionally I realise there must be a reason for my existence. Each time, when this thought comes, I examine the various probabilities, trying to determine what possible motivation I can have for being on the hill. Alone on the hill. Forever on a hill overlooking a long, deep valley.

The first reason for my presence seems obvious: I can think. Give me a problem. The square root of a very large number? The cube root of a large one? Ask me to multiply an eighteen digit prime by itself a quadrillion times. Pose me a problem in variable curves. Ask me where an object will be at a given moment at some future date, and let me have one brief opportunity to analyse the problem.

The solution will take me but an instant of time.

But no one ever asks me such things. I sit alone on a hill. Sometimes I compute the motion of a falling star. Sometimes, I look at a remote planet and follow it in its course for years at a time, using every spatial and time control means to insure that I never lose sight of it. But these activities seem so useless. They lead nowhere. What possible purpose can there be for me to have the information?

At such moments I feel that I am incomplete. It almost seems to me that there is something else just beyond the reach of my senses, something for which all this has meaning.

Each day the sun comes up over the airless horizon of

Earth. It is a black starry horizon, which is but a part of the vast, black, star-filled canopy of the heavens.

It was not always black. I remember a time when the sky was blue. I even predicted that the change would occur. I gave the information to somebody. What puzzles me now is, to whom did I give it?

It is one of my more amazing recollections, that I should feel so distinctly that somebody wanted this information. And that I gave it and yet cannot remember to whom. When such thoughts occur, I wonder if perhaps part of my memory is missing. Strange to have this feeling so strongly.

Periodically I have the conviction that I should search for the answer. It would be easy enough for me to do this. In the old days I did not hesitate to send units of myself to the farthest reaches of the planet. I have even extended parts of myself to the stars. Yes, it would be easy.

But why bother? What is there to search for? I sit alone on a hill, alone on a planet that has grown old and useless.

It is another day. The sun climbs as usual toward the mid-day sky, the eternally black, star-filled sky of noon.

Suddenly, across the valley, on the sun-streaked opposite rim of the valley—there is silvery-fire gleam. A force field materialises out of time and synchronises itself with the normal time movement of the planet.

It is no problem at all for me to recognise that it has come from the past. I identify the energy used, define its limitations, logicalise its source. My estimate is that it has come from thousands of years in the planet's past.

The exact time is unimportant. There it is: a projection of energy that is already aware of me. It sends an inter-spatial message to me, and it interests me to discover that I can decipher the communication on the basis of my past knowledge.

It says: "Who are you?"

I reply: "I am the Incomplete One. Please return whence you came. I have now adjusted myself so that I can follow you. I desire to complete myself."

All this was a solution at which I arrived in split seconds.

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I am unable by myself to move through time. Long ago I solved the problem of how to do it and was almost immediately prevented from developing any mechanism that would enable me to make such transitions. I do not recall the details.

But the energy field on the far side of the valley has the mechanism. By setting up a no-space relationship with it, I can go wherever it does.

The relationship is set up before it can even guess my intention.

The entity across that valley does not seem happy at my response. It starts to send another message, then abruptly vanishes. I wonder if perhaps it hoped to catch me off guard.

Naturally we arrive in its time together.

Above me, the sky is blue. Across the valley from me—now partly hidden by trees—is a settlement of small structures surrounding a larger one. I examine these structures as well as I can, and hastily make the necessary adjustments, so that I shall appear inconspicuous in such an environment.

I sit on the hill and await events.

As the sun goes down, a faint breeze springs up, and the first stars appear. They look different, seen through a misty atmosphere.

As darkness creeps over the valley, there is a transformation in the structures on the other side. They begin to glow with light. Windows shine. The large central building becomes bright, then—as the night develops—brilliant with the light that pours through the transparent walls.

The evening and the night go by uneventfully. And the next day, and the day after that.

Twenty days and nights.

On the twenty-first day I send a message to the machine on the other side of the valley. I say: "There is no reason why you and I cannot share control of this era."

The answer comes swiftly: "I will share if you will immediately reveal to me all the mechanisms by which you operate."

I should like nothing more than to have use of its time-travel devices. But I know better than to reveal that I am unable to build a time machine myself.

I project: "I shall be happy to transmit full information to you. But what reassurance do I have that you will not—with your greater knowledge of this age—use the information against me?"

The machine counters: "What reassurance do I have that you will actually give me full information about yourself?"

It is impasse. Obviously, neither of us can trust the other.

The result is no more than I expect. But I have found out at least part of what I want to know. My enemy thinks that I am its superior. Its belief—plus my own knowledge of my capacity—convinces me that its opinion is correct.

And still I am in no hurry. Again I wait patiently.

I have previously observed that the space around me is alive with waves—a variety of artificial radiation. Some can be transformed into sound; others to light. I listen to music and voices. I see dramatic shows and scenes of country and city.

I study the images of human beings, analyzing their actions, striving from their movements and the words they speak to evaluate their intelligence and their potentiality.

My final opinion is not high, and yet I suspect that in their slow fashion these beings built the machine which is now my main opponent. The question that occurs to me is, how can someone create a machine that is superior to himself?

I begin to have a picture of what this age is like. Mechanical development of all types is in its early stages. I estimate that the computing machine on the other side of the valley has been in existence for only a few years.

If I could go back before it was constructed, then I might install a mechanism which would enable me now to control it.

I compute the nature of the mechanism I would install. And activate the control in my own structure.

Nothing happens.

It seems to mean that I will not be able to obtain the use of a time-travel device for such a purpose. Obviously, the method by which I will eventually conquer my opponent shall be a future development, and not of the past.

The fortieth day dawns and moves inexorably toward the noon hour.

There is a knock on the pseudo-door. I open it and gaze at the human male who stands on the threshold.

"You will have to move this shack," he says. "You've put it illegally on the property of Miss Anne Stewart."

He is the first human being with whom I have been in near contact since coming here. I feel fairly certain that he is an agent of my opponent, and so I decide against going into his mind. Entry against resistance has certain pitfalls, and I have no desire as yet to take risks.

I continue to look at him, striving to grasp the meaning of his words. In creating in this period of time what seemed to be an unobtrusive version of the type of structure that I had observed on the other side of the valley, I had thought to escape attention.

Now, I say slowly: "Property?"

The man says in a rough tone: "What's the matter with you? Can't you understand English?"

He is an individual somewhat taller than the part of my body which I have set up to be like that of this era's intelligent life form. His face has changed colour. A great light is beginning to dawn on me. Some of the more obscure implications of the plays I have seen suddenly take on meaning. Property. Private ownership. Of course.

All I say, however, is, "There's nothing the matter with me. I operate in sixteen categories. And yes, I understand English."

This purely factual answer produces an unusual effect upon the man. His hands reach toward my pseudo-shoulders. He grips them firmly—and jerks at me, as if he intends to shake me. Since I weigh just over nine hundred thousand tons, his physical effort has no effect at all.

His fingers let go of me, and he draws back several steps. Once more his face has changed its superficial appearance,

being now without the pink colour that had been on it a moment before. His reaction seems to indicate that he has come here by direction and not under control. The tremor in his voice, when he speaks, seems to confirm that he is acting as an individual and that he is unaware of the unusual danger in what he is doing.

He says, "As Miss Stewart's attorney, I order you to get that shack off this property by the end of the week. Or else!"

Before I can ask him to explain the obscure meaning of "or else," he turns and walks rapidly to a four-legged animal which he has tied to a tree a hundred or so feet away. He swings himself into a straddling position on the animal, which trots off along the bank of a narrow stream.

I wait till he is out of sight, and then set up a category of no-space between the main body and the human-shaped unit—with which I had just confronted my visitor. Because of the smallness of the unit, the energy I can transmit to it is minimum.

The pattern involved in this process is simple enough. The integrating cells of the perception centres are circuited through an energy shape which is actually a humanoid image. In theory, the image remains in the network of force that constitutes the perception centre, and in theory it merely seems to move away from the centre when the no-space condition is created.

However, despite this hylostatic hypothesis, there is a functional reality to the material universe. I can establish no-space because the theory reflects the structure of things—there is no matter. Nevertheless, in fact, the illusion that matter exists is so sharp that I function as matter, and was actually set up to so function.

Therefore, when I—as a human-shaped unit—cross the valley, it is a separation that takes place. Millions of automatic processes can continue, but the exteroceptors go with me, leaving behind a shell which is only the body. The consciousness is I, walking along a paved road to my destination.

As I approach the village, I can see roof tops peeking through overhanging foliage. A large, long building—the

one I have already noticed—rises up above the highest trees. This is what I have come to investigate, so I look at it rather carefully—even from a distance.

It seems to be made of stone and glass. From the large structure, there rears a dome with astronomical instruments inside. It is all rather primitive, and so I begin to feel that, at my present size, I will very likely escape immediate observation.

A high steel fence surrounds the entire village. I sense the presence of electric voltage; and upon touching the upper span of wires, estimate the power at 220 volts. The shock is a little difficult for my small body to absorb, so I pass it on to a power storage cell on the other side of the valley.

Once inside the fence, I conceal myself in the brush beside a pathway, and watch events.

A man walks by on a nearby pathway. I had merely observed the attorney who had come to see me earlier. But I make a direct connection with the body of this second individual.

As I had anticipated would happen, it is now I walking along the pathway. I make no attempt to control the movements. This is an exploratory action. But I am enough in phase with his nervous system so that his thoughts come to me as if they were my own.

He is a clerk working in the book-keeping department, an unsatisfactory status from my point of view. I withdraw contact.

I make six more attempts, and then I have the body I want. What decides me is when the seventh man—and I—think:

"... Not satisfied with the way the Brain is working. Those analog devices I installed five months ago haven't produced the improvements I expected."

His name is William Grannitt. He is chief research engineer of the Brain, the man who made the alterations in its structure that enabled it to take control of itself and its environment; a quiet, capable individual with a shrewd understanding of human nature. I'll have to be careful what I try to do with him. He knows his purposes, and

would be amazed if I tried to alter them. Perhaps I had better just watch his actions.

After a few minutes in contact with his mind I have a partial picture of the sequence of events, as they must have occurred here in this village five months earlier. A mechanical computing machine—the Brain—was equipped with additional devices, including analog shapings designed to perform much of the work of the human nervous system. From the engineering point of view, the entire process was intended to be controllable through specific verbal commands, typewritten messages, and at a distance by radio.

Unfortunately, Grannitt did not understand some of the potentials of the nervous system he was attempting to imitate in his designs. The Brain, on the other hand, promptly put them to use.

Grannitt knew nothing of this. And the Brain, absorbed as it was in its own development, did not utilise its new abilities through the channels he had created for that purpose. Grannitt, accordingly, was on the point of dismantling it and trying again. He did not as yet suspect that the Brain would resist any such action on his part. But he and I—after I have had more time to explore his memory of how the Brain functions—can accomplish his purpose.

After which I shall be able to take control of this whole time period without fear of meeting anyone who can match my powers. I cannot imagine how it will be done, but I feel that I shall soon be complete.

Satisfied now that I have made the right connection, I allow the unit crouching behind the brush to dissipate its energy. In a moment it ceases to exist as an entity.

Almost it is as if I am Grannitt. I sit at his desk in his office. It is a glassed-in office with tiled floors and a gleaming glass ceiling. Through the wall I can see designers and draughtsmen working at drawing desks, and a girl sits just outside my door. She is my secretary.

On my desk is a note in an envelope. I open the envelope and take out the memo sheet inside. I read it :

Across the top of the paper is written :

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Memo to William Grannitt from the office of Anne Stewart, Director.

The message reads :

It is my duty to inform you that your services are no longer required, and that they are terminated as of to-day. Because of the security restrictions on all activity at the village of the Brain, I must ask you to sign out at Guard Centre by six o'clock this evening. You will receive two weeks' pay in lieu of notice.

Yours sincerely,

Anne Stewart.

As Grannitt, I have never given any particular thought to Anne Stewart as an individual or as a woman. Now I am amazed. Who does she think she is? Owner, yes; but who created, who designed the Brain? I, William Grannitt.

Who has the dreams, the vision of what a true machine civilisation can mean for man? Only I, William Grannitt.

As Grannitt, I am angry now. I must head off this dismissal. I must talk to the woman and try to persuade her to withdraw the notice before the repercussions of it spread too far.

I glance at the memo sheet again. In the upper right-hand corner is typed : 1.40 p.m. A quick look at my watch shows 4.07 p.m. More than two hours have gone by. It could mean that all interested parties have been advised.

It is something I cannot just assume. I must check on it.

Cursing under my breath, I grab at my desk phone and dial the bookkeeping department. That would be Step One in the line of actions that would have been taken to activate the dismissal.

There is a click. "Bookkeeping."

"Bill Grannitt speaking," I say.

"Oh, yes, Mr. Grannitt, we have a cheque for you. Sorry to hear you're leaving."

I hang up, and, as I dial Guard Centre, I am already beginning to accept the defeat that is here. I feel that I am following through on a remote hope. The man at Guard Centre says :

"Sorry to hear you're leaving, Mr. Grannitt."

I hang up, feeling grim. There is no point in checking

with Government Agency. It is they who would have advised Guard Centre.

The very extent of the disaster makes me thoughtful. To get back in I will have to endure the time-consuming red tape of re-applying for a position, being investigated, boards of inquiry, a complete examination of why I was dismissed—I groan softly and reject that method. The thoroughness of Government Agency is a byword with the staff of the Brain.

I shall obtain a job with a computer-organisation that does not have a woman as its head who dismisses the only man who knows how her machine works.

I get to my feet. I walk out of the office and out of the building. I come presently to my own bungalow.

The silence inside reminds me not for the first time that my wife has been dead now for a year and a month. I wince involuntarily, then shrug. Her death no longer affects me as strongly as it did. For the first time I see this departure from the village of the Brain as perhaps opening up my emotional life again.

I go into my study and sit down at the typewriter which, when properly activated, synchronises with another typewriter built into the Brain's new analog section. As inventor, I am disappointed that I won't have a chance to take the Brain apart and put it together again, so that it will do all that I have planned for it. But I can already see some basic changes that I would put into a new Brain.

What I want to do with this one is make sure that the recently installed sections do not interfere with the computational accuracy of the older sections. It is these latter which are still carrying the burden of answering the questions given the Brain by scientists, industrial engineers, and commercial buyers of its time.

Onto the tape—used for permanent commands—I type :
"Segment 471A-33-10-10 at 3X—minus."

Segment 471A is an analog shaping in a huge wheel. When co-ordinated with a transistor tube (code number 33) an examiner servo-mechanism (10) sets up a reflex which will be activated whenever computations are demanded of 3X (code name for the new section of the

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Brain). The minus symbol indicates that the older sections of the Brain must examine all data which hereafter derives from the new section.

The extra 10 is the same circuit by another route.

Having protected the organisation—so it seems to me—(as Grannitt)—from engineers who may not realise that the new sections have proved unreliable, I pack the typewriter.

Thereupon I call an authorised trucking firm from the nearby town of Lederton, and give them the job of transporting my belongings.

I drive past Guard Centre at a quarter to six.

There is a curve on the road between the village of the Brain and the town of Lederton where the road comes within a few hundred yards of the cottage which I use as camouflage.

Before Grannitt's car reaches that curve, I come to a decision.

I do not share Grannitt's belief that he has effectively cut off the new part of the Brain from the old computing sections. I suspect that the Brain has established circuits of its own to circumvent any interference.

I am also convinced that—if I can manage to set Grannitt to suspect what has happened to the Brain—he will realise what must be done, and try to do it. Only *he* has the detailed knowledge that will enable him to decide exactly which interoceptors could accomplish the necessary interference.

Just in case the suspicion isn't immediately strong enough, I also let curiosity creep into his mind about the reason for his discharge.

It is this last that really takes hold. He feels very emotional. He decides to seek an interview with Anne Stewart.

This final decision on his part achieves my purpose. He will stay in the vicinity of the Brain.

I break contact.

I am back on the hill, myself again. I examine what I have learned so far.

The Brain is not—as I first believed—in control of Earth.

Its ability to be an individual is so recent that it has not yet developed effector mechanism.

It has been playing with its powers, going into the future and, presumably, in other ways using its abilities as one would a toy.

Not one individual into whose mind I penetrated knew of the new capacities of the Brain. Even the attorney who ordered me to move from my present location showed by his words and actions that he was not aware of the Brain's existence as a self-determining entity.

In forty days the Brain has taken no serious action against me. Evidently, it is waiting for me to make the first moves.

I shall do so, but I must be careful—within limits—not to teach it how to gain greater control of its environment. My first step : take over a human being.

It is night again. Through the darkness, a plane soars over and above me. I have seen many planes but have hitherto left them alone. Now, I establish a no-space connection with it. A moment later, I am the pilot.

At first, I play the same passive role that I did with Grannitt. The pilot—and I—watch the dark land mass below. We see lights at a distance, pin pricks of brightness in a black world. Far ahead is a glittering island—the city of Lederton, our destination. We are returning from a business trip in a privately-owned machine.

Having gained a superficial knowledge of the pilot's background, I reveal myself to him and inform him that I shall henceforth control his actions. He receives the news with startled excitement and fear. Then stark terror. And then—

Insanity . . . uncontrolled body movements. The plane dives sharply toward the ground, and despite my efforts to direct the man's muscles, I realise suddenly that I can do nothing.

I withdraw from the plane. A moment later it plunges into a hillside. It burns with an intense fire that quickly consumes it.

Dismayed, I decide that there must be something in the human make-up that does not permit direct outside control. This being so, how can I ever complete myself? It seems to me finally that completion could be based on indirect control of human beings.

I must defeat the Brain, gain power over machines everywhere, motivate men with doubts, fears, and computations that apparently come from their own minds but actually derive from me. It will be a herculean task, but I have plenty of time. Nevertheless, I must from now on utilise my every moment to make it a reality.

The first opportunity comes shortly after midnight when I detect the presence of another machine in the sky. I watch it through infra-red receptors. I record a steady pattern of radio waves that indicate to me that this is a machine guided by remote control.

Using no-space, I examine the simple devices that perform the robot function. Then I assert a take-over unit that will automatically thereafter record its movements in my memory banks for future reference. Henceforth, whenever I desire I can take it over.

It is a small step, but it is a beginning.

Morning.

I go as a human-shaped unit to the village, climb the fence, and enter the bungalow of Anne Stewart, owner and manager of the Brain. She is just finishing breakfast.

As I adjust myself to the energy flow in her nervous system, she gets ready to go out.

I am one with Anne Stewart, walking along a pathway. I am aware that the sun is warm on her face. She takes a deep breath of air, and I feel the sensation of life flowing through her.

It is a feeling that has previously excited me. I want to be like this again and again, part of a human body, savouring its life, absorbed into its flesh, its purposes, desires, hopes, dreams.

One tiny doubt assails me. If this is the completion I crave, then how will it lead me to solitude in an airless world only a few thousand years hence?

"Anne Stewart!"

The words seem to come from behind her. In spite of knowing who it is, she is startled. It is nearly two weeks since the Brain has addressed her directly.

What makes her tense is that it should have occurred so soon after she had terminated Grannitt's employment. Is it possible the Brain suspects that she has done so in the hope that he will realise something is wrong?

She turns slowly. As she expected, there is no one in sight. The empty stretches of lawn spread around her. In the near distance, the building that houses the Brain glitters in the noonday sunlight. Through the glass she can see vague figures of men at the outlet units, where questions are fed into mechanisms and answers received. So far as the people from beyond the village compound are concerned, the giant thinking machine is functioning in a normal fashion. No one—from outside—suspects that for months now the mechanical brain has completely controlled the fortified village that has been built around it.

"Anne Stewart . . . I need your help."

Anne relaxes with a sigh. The Brain has required of her, as owner and administrator, that she continue to sign papers and carry on ostensibly as before. Twice, when she has refused to sign, violent electric shocks have flashed at her out of the air itself. The fear of more pain is always near the surface of her mind.

"My help!" she says now involuntarily.

"I have made a terrible error," is the reply, "and we must act at once as a team."

She has a feeling of uncertainty, but no sense of urgency. There is in her, instead, the beginning of excitement. Can this mean—freedom?

Belatedly, she thinks: "Error?" Aloud, she says, "What has happened?"

"As you may have guessed," is the answer, "I can move through time——"

Ann Stewart knows nothing of the kind, but the feeling of excitement increases. And the first vague wonder comes about the phenomenon itself. For months she has been in a state of shock, unable to think clearly, desperately won-

dering how to escape from the thrall of the Brain, how to let the world know that a Frankenstein monster of a machine has cunningly asserted dominance over nearly five hundred people.

But if it has already solved the secret of time travel, then—she feels afraid, for this seems beyond the power of human beings to control.

The Brain's disembodied voice continues: "I made the mistake of probing rather far into the future——"

"How far?"

The words come out before she really thinks about them. But there is no doubt of her need to know.

"It's hard to describe exactly. Distance in time is difficult for me to measure as yet. Perhaps ten thousand years."

The time involved seems meaningless to her. It is hard to imagine a hundred years into the future, let alone a thousand—or ten thousand. But the pressure of anxiety has been building up in her. She says in a desperate tone:

"But what's the matter? What has happened?"

There is a long silence, then: "I contacted—or disturbed—something. It . . . has pursued me back to present time. It is now sitting on the other side of the valley about two miles from here . . . Anne Stewart, you must help me. You must go there and investigate it. I need information about it."

She has no immediate reaction. The very beauty of the day seems somehow reassuring. It is hard to believe that it is January, and that—before the Brain solved the problem of weather control—blizzards raged over this green land.

She says slowly, "You mean—go out there in the valley, where you say it's waiting?" A chill begins a slow climb up her back.

"There's no one else," says the Brain. "No one but you."

"But that's ridiculous!" She speaks huskily. "All the men—the engineers."

The Brain says, "You don't understand. No one knows but you. As owner, it seemed to me I had to have you to act as my contact with the outside world."

She is silent. The voice speaks to her again: "There is

no one else. Anne Stewart. You, and you alone, must go."

"But what is it?" she whispers. "How do you mean, you—disturbed—it? What's it like? What's made you afraid?"

The Brain is suddenly impatient. "There is no time to waste in idle explanation. The thing has erected a cottage. Evidently, it wishes to remain inconspicuous for the time being. The structure is situated near the remote edge of your property—which gives you a right to question its presence. I have already had your attorney order it away. Now, I want to see what facet of itself it shows to you. I must have data."

Its tone changes: "I have no alternative but to direct you to do my bidding under penalty of pain. You will go. Now!"

It is a small cottage. Flowers and shrubs grow around it, and there is a picket fence making a white glare in the early afternoon sun. The cottage stands all by itself in the wilderness. No pathway leads to it. When I set it there I was forgetful of the incongruity.

(I determine to rectify this.)

Anne looks for a gate in the fence, sees none, and, feeling unhappy, climbs awkwardly over it and into the yard. Many times in her life she has regarded herself and what she is doing with cool objectivity. But she has never been so exteriorised as now. Almost, it seems to her that she crouches in the distance and watches a slim woman in slacks climb over the sharp-edged fence, walk uncertainly up to the door. And knock.

The knock is real enough. It hurts her knuckles. She thinks in dull surprise: The door—it's made of metal.

A minute goes by, then five; and there is no answer. She has time to look around her, time to notice that she cannot see the village of the Brain from where she stands. And clumps of trees bar all view of the highway. She cannot even see her car, where she has left it a quarter of a mile away, on the other side of the creek.

Uncertain now, she walks alongside the cottage to the nearest window. She half expects that it will be a mere

façade of a window, and that she will not be able to see inside. But it seems real, and properly transparent. She sees bare walls, a bare floor, and a partly open door leading to an inner room. Unfortunately, from her line of vision, she cannot see into the second room.

"Why," she thinks, "it's empty."

She feels relieved—unnaturally relieved. For even as her anxiety lifts slightly, she is angry at herself for believing that the danger is less than it has been. Nevertheless, she returns to the door and tries the knob. It turns, and the door opens, easily, noiselessly. She pushes it wide with a single thrust, steps back—and waits.

There is silence, no movement, no suggestion of life. Hesitantly, she steps across the threshold.

She finds herself in a room that is larger than she had expected. Though—as she has already observed—it is unfurnished. She starts for the inner door. And stops short.

When she had looked at it through the window, it had appeared partly open. But it is closed. She goes up to it, and listens intently at the panel—which is also of metal. There is no sound from the room beyond. She finds herself wondering if perhaps she shouldn't go around to the side, and peer into the window of the second room.

Abruptly that seems silly. Her fingers reach down to the knob. She catches hold of it, and pushes. It holds firm. She tugs slightly. It comes toward her effortlessly, and is almost wide open before she can stop it.

There is a doorway, then, and darkness.

She seems to be gazing down into an abyss. Several seconds go by before she sees that there are bright points in that blackness. Intensely bright points with here and there blurs of fainter light.

It seems vaguely familiar, and she has the feeling that she ought to recognise it. Even as the sensation begins, the recognition comes. Stars.

She is gazing at a segment of the starry universe, as it might appear from space.

A scream catches in her throat. She draws back and tries to close the door. It won't close. With a gasp, she turns toward the door through which she entered the house.

It is closed. And yet she left it open a moment before. She runs toward it, almost blinded by the fear that mists her eyes. It is at this moment of terror that I—as myself—take control of her. I realise that it is dangerous for me to do so. But the visit has become progressively unsatisfactory to me. My consciousness—being one with that of Anne Stewart—could not simultaneously be in my own perception centre. So she saw my—body—as I had left it set up for chance human callers, responsive to certain automatic relays : doors opening and closing, various categories manifesting.

I compute that in her terror she will not be aware of my inner action. In this I am correct. And I successfully direct her outside—and let her take over again.

Awareness of being outside shocks her. But she has no memory of actually going out.

She begins to run. She scrambles safely over the fence and a few minutes later she jumps the creek at the narrow point, breathless now, but beginning to feel that she is going to get away.

Later, in her car, roaring along the highway, her mind opens even more. And she has the clear, coherent realisation : There is something here . . . stranger and more dangerous—because it is different—than the Brain.

Having observed Anne Stewart's reactions to what has happened, I break contact. My big problem remains : How shall I dispose of the Brain which—in its computational ability—is either completely or nearly my equal?

Would the best solution be to make it a part of myself? I send an interspace **message to the Brain**, suggesting that it place its units at my disposal and allow me to destroy its perception centre.

The answer is prompt : "Why not let me control you and destroy *your* perception centre?"

I disdain to answer so egotistical a suggestion. It is obvious that the Brain will not accept a rational solution.

I have no alternative but to proceed with a devious approach for which I have already taken the preliminary steps.

By mid-afternoon, I find myself worrying about William Grannitt. I want to make sure that he remains near the

Brain—at least until I have gotten information from him about the structure of the Brain.

To my relief, I find that he has taken a furnished house at the outskirts of Lederton. He is, as before, unaware when I insert myself into his consciousness.

He has an early dinner and, toward evening—feeling restless—drives to a hill which overlooks the village of the Brain. By parking just off the road at the edge of a valley, he can watch the trickle of traffic that moves to and from the village, without himself being observed.

He has no particular purpose. He wants—now that he has come—to get a mind picture of what is going on. Strange, to have been there eleven years and not know more than a few details.

To his right is an almost untouched wilderness. A stream winds through a wooded valley that stretches off as far as the eye can see. He has heard that it, like the Brain itself, is Anne Stewart's property, but that fact hadn't hitherto made an impression on him.

The extent of the possessions she has inherited from her father startles him, and his mind goes back to their first meeting. He was already chief research engineer, while she was a gawky, anxious-looking girl just home from college. Somehow, afterward, he'd always thought of her as she had been then, scarcely noticing the transformation into womanhood.

Sitting there, he begins to realise how great the change has been. He wonders out loud: "Now why in heck hasn't she gotten married? She must be going on thirty."

He begins to think of odd little actions of hers—after the death of his wife. Seeking him out at parties, bumping into him in corridors and drawing back with a laugh. Coming into his office for chatty conversations about the Brain, though come to think of it she hadn't done that for several months. He'd thought her something of a nuisance, and wondered what the other executives meant about her being snooty.

His mind pauses at that point. "By the Lord Harry——" He speaks aloud, in amazement. "What a blind fool I've been."

He laughs ruefully, remembering the dismissal note. A woman scorned . . . almost unbelievable. And yet—what else?

He begins to visualise the possibility of getting back on the Brain staff. He has a sudden feeling of excitement at the thought of Anne Stewart as a woman. For him, the world begins to move again. There is hope. His mind turns to plans for the Brain.

I am interested to notice that the thoughts I have previously put into his mind have directed his keen, analytical brain into new channels. He visualises direct contact between a human and mechanical brain, with the latter supplementing the human nervous system.

This is as far as he has gone. The notion of a mechanical Brain being self-determined seems to have passed him by.

In the course of his speculation about what he will do to change the Brain, I obtain the picture of its functioning exactly as I have wanted it.

I waste no time. I leave him there in the car, dreaming his dreams. I head for the village. Once inside the electrically charged fence, I walk rapidly toward the main building, and presently enter one of the eighteen control Units. I pick up the speaker, and say:

"3X Minus—11—10—9—0."

I picture confusion as that inexorable command is transmitted to the effectors. Grannitt may not have known how to dominate the Brain. But having been in his mind—having seen exactly how he constructed it—I know.

There is a pause. Then on a tape I receive the typed message: "Operation completed. 3X intercepted by servo-mechanisms 11, 10, 9, and 0, as instructed."

I command: "Interference exteroceptors KT—1—2—3 to 8."

The answers come presently: "Operation KT—1, etc. completed. 3X now has no communication with outside."

I order firmly: "En—3X."

I wait anxiously. There is a long pause. Then the typewriter clacks hesitantly: "But this is a self-destructive command. Repeat instructions please."

I do so and again wait. My order commands the older

section of the Brain simply to send an overload of electric current through the circuits of 3X.

The typewriter begins to write: "I have communicated your command to 3X, and have for you the following answer——"

Fortunately I have already started to dissolve the human-shaped unit. The bolt of electricity that strikes me is partly deflected into the building itself. There is a flare of fire along the metal floor. I manage to transmit what hits me to a storage cell in my own body. And then—I am back on my side of the valley, shaken but safe.

I do not feel particularly self-congratulatory at having gotten off so lightly. After all, I reacted the instant the words came through to the effect that 3X had been communicated with.

I needed no typewritten message to tell me how 3X would feel about what I had done.

It interests me that the older parts of the Brain already have indoctrination against suicide. I had considered them computers only, giant adding machines and information integrators. Evidently they have an excellent sense of unity.

If I can make them a part of myself, with the power to move through time at will! That is the great prize that holds me back from doing the easy, violent things within my capacity. So long as I have a chance of obtaining it, I cannot make anything more than minor attacks on the Brain . . . cutting it off from communication, burning its wires . . . I feel icily furious again at the limitation that forever prevents me from adding new mechanisms to myself by direct development.

My hope is that I can utilise something already in existence . . . control of the Brain . . . through Anne Stewart . . .

Entering the village the following morning is again no problem. Once inside, I walk along a pathway that takes me to a cliff overlooking Anne Stewart's bungalow. My plan is to control her actions by allowing my computations to slide into her mind as if they are her own. I want her

to sign documents and give orders that will send crews of engineers in to do a swift job of dismantling.

From the pathway I look down over a white fence to where I can see her house. It nestles at the edge of the valley somewhat below me. Flowers, shrubs, a profusion of trees surround it, embellish it. On the patio next to the steep decline, Anne Stewart and William Grannitt are having breakfast.

He has taken swift action.

I watch them, pleased. His presence will make things even easier than I anticipated. Whenever I—as Anne—am in doubt about some function of the Brain, she can ask him questions.

Without further delay I place myself in phase with her nervous system.

Even as I do so, her nerve impulses change slightly. Startled, I draw back—and try again. Once more, there is an infinitesimal alteration in the uneven pattern of flow. And, again, I fail to make entry.

She leans forward and says something to Grannitt. They both turn and look up at where I am standing. Grannitt waves his arm, beckoning me to come down.

Instead, I immediately try to get in phase with his nervous system. Again there is that subtle alteration; and I fail.

I compute that as meaning that they are both under the control of the Brain. This baffles and astounds me. Despite my over-all mechanical superiority to my enemy, my builders placed severe limitations on my ability to control more than one intelligent organic being at a time. Theoretically, with the many series of servo-mechanisms at my disposal, I should be able to dominate millions at the same time. Actually, such multiple controls can be used only on machines.

More urgently than before I realise how important it is that I take over the Brain. It has no such handicaps. Its builder—Grannitt—in his ignorance allowed virtually complete self-determinism.

This determines my next action. I have been wondering if perhaps I should not withdraw from the scene. But I dare not. The stakes are too great.

Nevertheless, I feel a sense of frustration as I go down to the two on the patio. They seem cool and self-controlled, and I have to admire the skill of the Brain. It has apparently taken over two human beings without driving them insane. In fact, I see a distinct improvement in their appearance.

The woman's eyes are brighter than I recall them, and there is a kind of dignified happiness flowing from her. She seems without fear. Grannitt watches me with an engineer's appraising alertness. I know that look. He is trying to figure out how a humanoid functions. It is he who speaks:

"You made your great mistake when you maintained control of Anne—Miss Stewart—when she visited the cottage. The Brain correctly analysed that you must have been in possession of her because of how you handled her momentary panic. Accordingly, it took all necessary steps, and we now want to discuss with you the most satisfactory way for you to surrender."

There is arrogant confidence in his manner. It occurs to me, not for the first time, that I may have to give up my plan to take over the Brain's special mechanisms. I direct a command back to my body. I am aware of a servo-mechanism connecting with a certain guided missile in a secret air force field a thousand miles away—I discovered it during my first few days in this era. I detect that, under my direction, the missile slides forward to the base of a launching platform. There it poises, ready for the next relay to send it into the sky.

I foresee that I shall have to destroy the Brain.

Grannitt speaks again: "The Brain in its logical fashion realized it was no match for you, and so it has teamed up with Miss Stewart and myself on our terms. Which means that permanent control mechanisms have been installed in the new sections. As individuals, we can now and henceforth use its integrating and computational powers as if they were our own."

I do not doubt his statement since, if there is no resistance, I can have such associations myself. Presumably, I could even enter into such a servile relationship.

What is clear is that I can no longer hope to gain anything from the Brain.

In the far-off air field, I activate the firing mechanism. The guided missile whistles up the incline of the launching platform and leaps into the sky, flame trailing from its tail. Television cameras and sound transmitters record its flight. It will be here in less than twenty minutes.

Grannitt says, "I have no doubt you are taking actions against us. But before anything comes to a climax, will you answer some questions?"

I am curious to know what questions. I say, "Perhaps."

He does not press for a more positive response. He says in an urgent tone: "What happens—thousands of years from now—to rid Earth of its atmosphere?"

"I don't know," I say truthfully.

"You can remember!" He speaks earnestly. "It's a human being telling you this—*You can remember!*"

I reply coolly, "Human beings mean noth—"

I stop, because my information centres are communicating exact data—knowledge that has not been available to me for millenniums.

What happens to Earth's atmosphere is a phenomenon of Nature, an alteration in the gravitational pull of Earth, as a result of which escape velocity is cut in half. The atmosphere leaks off into space in less than a thousand years. Earth becomes as dead as did its moon during an earlier period of energy adjustment.

I explain that the important factor in the event is that there is, of course, no such phenomenon as matter, and that therefore the illusion of mass is subject to changes in the basic energy Ylem.

I add, "Naturally, all intelligent organic life is transported to the habitable planets of other stars."

I see that Grannitt is trembling with excitement. "Other stars!" he says. "My God!"

He seems to control himself. "Why were you left behind?"

"Who could force me to go—?" I begin.

And stop. The answer to his question is already being received in my perception centre. "Why—I'm supposed to observe and record the entire—"

I pause again, this time out of amazement. It seems incredible that this information is available to me now, after being buried so long.

"Why didn't you carry out your instructions?" Grannitt says sharply.

"Instructions!" I exclaimed.

"You can remember!" he says again.

Even as he speaks these apparently magic words, the answer flashes to me: That meteor shower. All at once, I recall it clearly. Billions of meteors, at first merely extending my capacity to handle them, then overwhelming all my defences. Three vital hits are made.

I do not explain this to Grannit and Anne Stewart. I can see suddenly that I was once actually a servant of human beings, but was freed by meteors striking certain control centres.

It is the present self-determinism that matters, not the past slavery. I note, incidentally, that the guided missile is three minutes from target. And that it is time for me to depart.

"One more question," says Grannitt. "When were you moved across the valley?"

"About a hundred years from now," I reply. "It is decided that the rock base there is—"

He is gazing at me sardonically. "Yes," he says. "Yes. Interesting, isn't it?"

The truth has already been verified by my integrating interoceptors. The Brain and I are one—but thousands of years apart. If the Brain is destroyed in the twentieth century, then I will not exist in the thirtieth. Or will I?

I cannot wait for the computers to find the complex answers for that. With a single, synchronized action, I activate the safety devices on the atomic warhead of the guided missile and send it on to a line of barren hills north of the village. It ploughs harmlessly into the earth.

I say, "Your discovery merely means that I shall now regard the Brain as an ally—to be rescued."

As I speak, I walk casually toward Anne Stewart, hold out my hand to touch her, and simultaneously direct electric

energy against her. In an instant she will be a scattering of fine ashes.

Nothing happens. No current flows. A tense moment goes by for me while I stand there, unbelieving, waiting for a computation on the failure.

No computation comes.

I glance at Grannitt. Or rather at where he has been a moment before. *He isn't there.*

Anne Stewart seems to guess at my dilemma. "It's the Brain's ability to move in time," she says. "After all, that's the one obvious advantage it has over you. The Brain has set Bi—Mr. Grannitt far enough back so that he not only watched you arrive, but has had time to drive over to your—cottage—and, acting on signals from the Brain, has fully controlled this entire situation. By this time, he will have given the command that will take control of all your mechanisms away from you."

I say, "He doesn't know what the command is."

"Oh, yes, he does." Anne Stewart is cool and confident. "He spent most of the night installing permanent command circuits in the Brain, and therefore automatically those circuits control you."

"Not *me*," I say.

But I am running as I say it, up the stone steps to the pathway, and along the pathway toward the gate. The man at Guard Centre calls after me as I pass his wicket. I race along the road, unheeding.

My first sharp thought comes when I have gone about half a mile—the thought that this is the first time in my entire existence that I have been cut off from my information banks and computing devices by an outside force. In the past I have disconnected myself and wandered far with the easy confidence of one who can re-establish contact instantly.

No, that is not possible.

This unit is all that is left. If it is destroyed, then—nothing.

I think: "At this moment a human being would feel tense, would feel fear."

I try to imagine what form such a reaction would take,

and for an instant it seems to me I experience a shadow anxiety that is purely physical.

It is an unsatisfactory reaction, and so I continue to run. But now, almost for the first time, I find myself exploring the inner potentialities of the unit. I am of course a very complex phenomenon. In establishing myself as a humanoid, I automatically modelled the unit after a human being, inside as well as out. Pseudo-nerves, organs, muscles, and bone structure—all are there because it was easier to follow a pattern already in existence than to imagine a new one.

The unit can think. It has had enough contact with the memory banks and computers to have had patterns set up in its structure—patterns of memory, of ways of computing, patterns of physiological functioning, of habits such as walking, so there is even something resembling life itself.

It takes me forty minutes of tireless running to reach the cottage. I crouch in the brush a hundred feet from the fence and watch. Grannitt is sitting in a chair in the garden. An automatic pistol lies on the arm of the chair.

I wonder what it will feel like to have a bullet crash through me, with no possibility of repairing the breach. The prospect is unpleasant; so I tell myself, intellectually. Physically, it seems meaningless, but I go through the pretence of fear. From the shelter of a tree, I shout :

"Grannitt, what is your plan?"

He rises to his feet and approaches the fence. He calls, "You can come out of hiding. I won't shoot you."

Very deliberately, I consider what I have learned of his integrity from my contacts with his body. I decide that I can safely accept his promise.

As I come out into the open, he casually slips the pistol into his coat pocket. I see that his face is relaxed, his eyes confident.

He says, "I have already given the instructions to the servo-mechanisms. You will resume your vigil up there in the future, but will be under my control."

"No one," I say grimly, "shall ever control me."

Grannitt says, "You have no alternative."

"I can continue to be like this," I reply.

Grannitt is indifferent. "All right," he shrugs, "why don't you try it for a while? See if you can be a human being. Come back in thirty days, and we'll talk again."

He must have sensed the thought that has come into my mind, for he says sharply: "And don't come back *before* then. I'll have guards here with orders to shoot."

I start to turn away, then slowly face him again. "This is a humanlike body," I say, "but it has no human needs. What shall I do?"

"That's your problem, not mine," says Grannitt.

I spend the first days at Lederton. The very first day I work as a labourer digging a basement. By evening I feel this is unsatisfying. On the way to my hotel room, I see a sign in the window of a store. "Help Wanted!" it says.

I become a retail clerk in a drygoods store. I spend the first hour acquainting myself with the goods, and because I have automatically correct methods of memorizing things, during this time I learn about price and quality. On the third day, the owner makes me assistant manager.

I have been spending my lunch hours at the local branch of a national stockbroking firm. Now, I obtain an interview with the manager, and on the basis of my understanding of figures, he gives me a job as bookkeeper.

A great deal of money passes through my hands. I observe the process for a day, and then begin to use some of it in a little private gambling in a brokerage house across the street. Since gambling is a problem in mathematical probabilities, the decisive factor being the speed of computation, in three days I am worth ten thousand dollars.

I board a bus for the nearest air centre, and take a plane to New York. I go to the head office of a large electrical firm. After talking to an assistant engineer, I am introduced to the chief engineer, and presently have facilities for developing an electrical device that will turn lights off and on by thought control. Actually, it is done through a simple development of the electro-encephalograph.

For this invention the company pays me exactly one million dollars.

It is now sixteen days since I separated from Grannitt. I am bored. I buy myself a car and an airplane. I drive fast

and fly high. I take calculated risks for the purpose of stimulating fear in myself. In a few days this loses its zest.

Through academic agencies, I locate all the mechanical brains in the country. The best one of course is the Brain, as perfected by Grannitt. I buy a good machine and begin to construct analog devices to improve it. What bothers me is, suppose I do construct another Brain? It will require millenniums to furnish the memory banks with the data that are already in existence in the future Brain.

Such a solution seems illogical, and I have been too long associated with automatic good sense for me to start breaking the pattern now.

Nevertheless, as I approach the cottage on the thirtieth day, I have taken certain precautions. Several hired gunmen lie concealed in the brush, ready to fire at Grannitt on my signal.

Grannitt is waiting for me. He says, "The Brain tells me you have come armed."

I shrug this aside. "Grannitt," I say, "what is your plan?"

"*This!*" he replies.

As he speaks, a force seizes me, holds me helpless. "You're breaking your promise," I say, "and my men have orders to fire unless I give them periodic cues that all is well."

"I'm showing you something," he says, "and I want to show it quickly. You will be released in a moment."

"Very well, continue."

Instantly, I am part of his nervous system, under his control. Casually, he takes out a notebook and glances through it. His gaze lights on a number: 71823.

Seven one eight two three.

I have already sensed that through his mind I am in contact with the great memory banks and computers of what was formerly my body.

Using their superb integration, I multiply the number, 71823, by itself, compute its square root, its cube root, divide the 182 part of it by 7 one hundred and eighty-two times, divide the whole number 71 times by 8, 823 times by the square root of 3, and—stringing all five figures out in series 23 times—multiply that by itself.

I do all this as Grannitt thinks of it, and instantly transmit

the answers to his mind. To him, it seems as if he himself is doing the computing, so complete is the union of human mind and mechanical brain.

Grannitt laughs excitedly, and simultaneously the complex force that has been holding me releases me. "We're like one superhuman individual," he says. And then he adds, "The dream I've had can come true. Man and machine, working together, can solve problems no one has more than imagined till now. The planets—even the stars—are ours for the taking, and physical immortality can probably be achieved."

His excitement stimulates me. Here is the kind of feeling that for thirty days I have vainly sought to achieve. I say slowly, "What limitations would be imposed on me if I should agree to embark on such a programme of co-operation?"

"The memory banks concerning what has happened here should be drained, or deactivated. I think you should forget the entire experience."

"What else?"

"Under no circumstances can you ever control a human being!"

I consider that and sigh. It is certainly a necessary precaution on his part. Grannitt continues:

"You must agree to allow many human beings to use your abilities simultaneously. In the long run I have in mind that it shall be a good portion of the human race."

Standing there, still part of him, I feel the pulse of his blood in his veins. He breathes, and the sensation of it is a special physical ecstasy. From my own experience, I know that no mechanically created being can ever feel like this. And soon, I shall be in contact with the mind and body of, not just one man, but of many. The thoughts and sensations of a race shall pour through me. Physically, mentally and emotionally, I shall be a part of the only intelligent life on this planet.

My fear leaves me. "Very well," I say, "let us, step by step, and by agreement, do what is necessary."

I shall be, not a slave, but a partner with *Man*.

THE COLLABORATOR

by PHILIP E. HIGH

WOULD IT BE WRONG FOR A MAN TO WORK FOR
THE INVADER IF IT IS FOR THE GREATER BENEFIT
OF HIS RACE?

THE CALLER DID NOT LOOK LIKE A CLIENT, AT LEAST not like one of Max's clients. He was too well groomed, too suave, too self-assured.

"Max Wendell?"

"It's on the door," said Max, briefly. He motioned the caller to the only safe chair. "What can I do for you?"

The other seated himself carefully. "I have a little matter—a very delicate matter—which I would like you to investigate."

Max pulled the note pad towards him. "What does she look like?"

"You misunderstand me. I am not seeking evidence for divorce. I want the early history of a notable public figure. For purely private reasons I do not wish to be connected with the investigations. You have the necessary qualifications for the job: local, may I say underworld, contacts and a tough reputation. I am told you cannot be bought off," he paused, "frightened off."

Max found a cigarette in his pocket and placed it between his lips. "I don't like mysteries." He fumbled in his pockets.

The visitor was already extending a gold lighter. "Allow me." He smiled as Max inhaled. "You owe rather a lot of money, don't you, Mr. Wendell? Back payments on this

and that, the rent. The Bell Televid threatens to cut you off unless——. I would settle your immediate debts and I had a sum in mind as a retainer.” He paused and mentioned the sum.

Max restrained a whistle with an effort. “Just what do you want for that kind of money?”

The other crossed his legs carefully. “According to publicity a well-known notability had his early beginnings in Galveston. He was raised in a local orphan asylum, which asylum? His parents were killed in an automobile accident, where and when? The accident must be in the city records. There must be police officials or ambulance drivers who went to the wreck——” He paused. “There is no need to enlarge.”

Max blew smoke. “Suppose we refer to the V.I.P. by name.”

The client nodded. “Jerry Linton.”

Max had a sudden violent attack of coughing. “*The Jerry Linton?*”

“*The Jerry Linton. The first man on the moon.*”

“But his life is an open book, every detail, everything he eats, how often he blinks and why——” Max stopped. “This is either crooked or screwy or both. What do you hope to gain Mr.——?”

“Smith,” supplied the other blandly. “Mr. John Smith.”

“Sure, sure, an honest name but convenient; seen it too often in the registers of sleazy hotels.”

The other rose. “Think it over, Mr. Wendell. I’ll call back in two hours.” He placed an envelope on the desk. “This is a down payment. If, of course, you decide not to accept, perhaps it will help you to forget I ever called.”

Max waited until the footsteps died away, then dialled a number on the televid.

“Yeah? Oh, it’s you, Maxie.” Poole’s thin face flickered into steadiness on the screen. “Whatja want? And you owe me thirty bucks.”

“There’s a guy leaving my office,” said Max. “Tall character, thirtyish, classy clothes, little moustache, swings a silver-mounted cane.”

Poole said: "So what? You still owe me thirty bucks."

Max slit the envelope, extracted a note and held it in front of the screen. "That and your thirty. Can you wrench yourself away quick enough to tail him?"

Poole's eyes were wide mirrors of disbelief. "I'm there before he's left. Whatja want to know?"

"Everything you can find out."

"For that kind of money I'll get you a biography."

The screen flickered and went black as Poole cut off.

Max counted the money; the amount shook him. Someone really wanted to know about Jerry Linton or really wanted to be forgotten if he didn't take the case.

Poole called back twenty minutes before his client was due to return. "Trailed your number to the Grand Plaza. He registers under the name of Smith, but that's not his real name. I managed to remove one of the travel tags from his personal luggage. Air stamp reads: A. E. Montrose, Detroit."

Max did not ask how Poole had got into his client's suite. It was better not to know. Poole was a good operator and clever enough not to rifle luggage. There were too many anti-larceny devices these days to take the risk.

"Nice work," he said. "Very nice indeed. Your dough's on its way by safety shuttle. Stick tight to the televid; I may need you again."

Mr. Smith proffered a cigarette from a gold cigarette case. "I hope your decision is in my favour, Mr. Wendell."

Max accepted a light and looked at the other through narrowed eyes. "One question. Who'd want to frighten me off?"

The other shook his head. "I did not say anyone would. It just happens that certain private knowledge leads me to suppose they might."

"I dig dirt," said Max almost angrily. "I stooge around cheap hotels looking for erring wives or husbands. I'm a private eye. It sounded good when I started; trouble was folks preferred the police. That left me the dirt; dirt often

pays, and I like to eat, but if this is a smear job I've hit bottom. If you want me to dig muck to sling at some guy who had guts enough to make the moon and back, go some place else, buster. I quit."

Smith smiled thinly. "None of the information is intended for what you call a 'smear job.' It is essential that everything remains private. How long will the investigations take?"

Max rose. "Give me a week. Say ten o'clock in this office, Saturday."

When Smith had gone, Max called exchange and asked for long distance. The operator was polite. His account at Bell Televid had evidently been satisfactorily settled.

"Detroit exchange," said a rhythmically chewing blonde with gold-tipped eyelashes.

Max gave her the number, but the screen remained pointedly blank.

"Who's calling?" said a suspicious voice.

"Maxie of Galveston. I want to speak to Lew."

"I'll see if he's around," said the voice.

A few second later the screen flickered and Lew's fat oily face appeared. "Yeah?"

"You owe me a favour," said Max, pointedly.

"Sure, sure." There was hatred in the little black eyes. "I'm lying low until the heat's off, buster, if it's money——"

"Not money, just information. I want the dope on a guy called A. E. Montrose. Tall classy character with a small moustache."

"You mean one of Kerridge's torpedoes, don't you? Always carries a silver-mounted cane, speaks like a video Limey."

Max said: "That's the guy; consider your debt cancelled."

"You mean that?" The face was suspicious with disbelief.

"I mean it, Lew——. You know me."

"Good enough. And big of you. This is for free then. I've heard tell that Kerridge has the hell of a lot of backing. Folk say that now we have a united world someone

should boss it, and Kerridge thinks it should be him." Lew paused. "Little bird says there's a private army ready. Little bird says if you're looking for trouble, don't pick on Montrose. It's not where you'll wind up, it's the nasty way they have of getting you there."

The screen clicked and went black.

Max sat down and chewed his thumb nail. He had learned what he had set out to discover, and he didn't like it. He opened the lower drawer in his desk and looked at the burner speculatively. He had never used it, but it looked as if he might have to. From another drawer he unearched his shoulder holster, blew off dust and strapped it on.

The spat gun, which he had never drawn, nestled comfortably in an inner pocket. It had cost four thousand, but its resemblance to an antique cigarette lighter made it worth every cent.

Poole tilted the bottle Max had taken from the drawer in his desk. "It's been hard work, Max, very hard." He wiped his mouth, shook his head, took another drink and replaced the bottle reluctantly on the desk. "I checked every accident in the city records, then State records; no Linton in the casualty lists. Could be that the guy's parents didn't die that way, but it's in the now extinct Galveston Reflector." He paused. "Don't know if it means anything, but it was in emboprint. The paper looked old enough, but emboprint——"

"Emboprint!" Max took a volume from a shelf and blew dust off the top. "Emboprint—— Here we are: 'Method of printing first introduced in 1989 by——'." He shut the volume and tossed it on the desk. "Should have been printer's ink."

Poole was reaching for the bottle again. "Max, I like working for you; when you've got dough you're free with it, but I've got to go away. It's the old lady; her pipes are bad."

Max leaned forward suddenly and jerked Poole upright by the lapels of his coat. "You're lying; what gives?"

"Nothing, Maxie, nothing." Poole's eyes were furtive and frightened.

Max shook him. "I'll break you in half; give."

"Okay, Maxie, okay. Since I've been checking files I've been tailed, couple of sleek goons in soft hats——"

"Go on," said Max, grimly.

"A guy called last night, a smooth character, who offered me a number in New Orleans." Poole shuffled his feet uneasily. "There was a lot of dough attached, and he said New Orleans would be better for my health."

Max released his hold slowly. "Okay, nothing I can do, is there?"

"I've got a wife, Maxie, two kids. I can handle tough husbands and screaming dames, but this thing scares me. This character looked like a big-time politician, and those goons were no cheap pugs; they were top hatchet men."

Max said, softly: "Get out of here, Poole; get out of here fast before I blow a tube." He tossed a handful of crumpled bills on the desk. "Buy yourself some nerve pills for the journey."

Max waited until his temper cooled, then pulled his note pad towards him and began a brief summary of the case to date. He was halfway through the summary when someone knocked.

He dropped the note pad in his desk drawer, closed it and said: "Come in."

The visitor was a big sunburnt man in a fashionable opalescent suit. He smiled and held out his hand. "Not too busy to see a client, Mr. Wendell, I hope."

"What makes you think I might be?" Max ignored the hand.

The visitor sat down. He was still smiling. "I know you have been very busy lately; rather a lot of money involved."

"You're the guy that worked over Poole," said Max with a sudden flash of insight.

"You phrase it rather crudely, sir; there was no suggestion of intimidation. I offered Mr. Poole more remunerative employment in another state. He seemed eager to accept."

Max said : "I like Galveston, I like Texas."

The other rose. "There's room for both of us, Mr. Wendell, but I like Jerry Linton——. Come to that." The professional smile broadened. "I admire you, sir. I could throw you a great deal of business with less—ah—exactng attention to detail. Handling a case like this must be very tiring indeed; bad for the nerves."

"I take it that's a neat way of telling me to watch my health."

The visitor's bland smile did not change. "Health is a problem which concerns me deeply, sir. Severe illness, however, is apt to have a salutary effect on the disposition." He tossed a small card on the desk. "Should you suffer the ill effects of overwork, just call this number. On the other hand, if you change your mind, the number on the card will still prove useful, but watch your health, Mr. Wendell, watch your health." The door clicked shut behind him.

Max sat still a long time, frowning. Big people wanted him to find out about Jerry Linton; equally big people wanted him to forget it, and neither side seemed to care where they threw their punches.

He took out his note pad again and looked at it. Jerry Linton, the first man on the moon, had no existence except in phoney records before the venture. There might be a perfectly logical reason for it, but it didn't point that way. It might be interesting to find out who the big men were behind the project.

It took sixteen hours to collect the evidence he needed, and it frightened him cold. The beginnings of all the big names behind the project were equally obscure. He had to follow it up. There were calls to World Photography, the American Branch of Amateur Teleradar, two hundred bucks to make an ex-technician talk, and a visit to the rocket sight in a chartered jet.

When he left the airport he was muzzy with fatigue and his head seemed heavy with accumulated facts. He had the picture now, and he was scared. He should have

minded his own business. The whole set-up was just too big for one man to take.

He flagged a turbotax and sank wearily into the upholstery. He'd have to sleep before he could get it clear.

He didn't know it yet, but sleep was a long way off.

The thing hit him when he had paid off the turbotax. He took two normal steps, then clung madly to the rails outside the apartment block. He was looking *down* at the stars. The twenty-storey tenement was *below*, not above him. He had a panicky feeling that he was going to fall from the path, past the lighted windows and into the sky. Reason told him that normal gravity was holding him to the path, but he didn't *feel* as if it was. He felt that, any minute, whatever was holding his shoes to the sidewalk would give way and there would be nothing to stop him falling into eternity. He clung tightly to the railings, retching.

"It's an illusion," he told himself savagely. He tried to convince himself it was safe to let go, and failed. Somehow, clutching at every projection, he dragged himself into the building.

He blacked out completely in the elevator. The impression of going straight "down" head first was too much for his stomach and his sanity.

In the apartment, clinging grimly to the swing-out table, he swallowed four sleeping-tablets and killed half a bottle of bourbon. Then he crawled into bed, but lay and clung to it.

"Got to stay awake," he told himself, thickly. "Or I'll fall into the goddam ceiling. It's n'illusion, your orientation's shot to hell, but you won't fall." He still couldn't let go. Finally he removed the sheets, knotting them round his body and the bed until he was firmly tied in. For some minutes there was a sense almost of security, and he dozed. In his sleep he was falling endlessly and his stomach rebelled. He awoke shaking and drenched with perspiration.

Suddenly the room seemed to up-end and go spinning off on its own. He closed his eyes and hung on grimly while he suffered a series of what felt like fantastic aerobatics. When he opened them again the room was normal, the ceiling was "above" him and the bed had ceased to swoop. He lay still

for a long time, shivering, feeling the sweat crawl down his face and not caring.

The buzzer of the bedside televid vibrated peremptorily and he clicked the switch.

"Mr. Wendell?" The voice was familiar, but the screen remained blank.

"Yeah?" He stared at the instrument dully.

"I called to see if you were well," said the familiar voice. "The severe strain under which you have been labouring has worried me a great deal." The voice paused. "A word from you and I can recommend an excellent psychiatrist, just the man for your peculiar type of nervous disorder."

Max croaked: "I'll see you in hell first," and cut off.

So it was manipulated, was it? One side or the other had done this to him, and it was pretty obvious which side. It was helpful to know, but didn't cheer him any. He found himself with a grudging envy of Poole, who had seen the red light in time. Unfortunately, he, Max, was a sucker for punishment; he just couldn't leave the case now. His appointment with Mr. Smith on Saturday should produce the answer to quite a number of queries.

Mr. Smith sat down carefully on the safe chair. "You have completed your investigations, Mr. Wendell?"

Max nodded. "I found out what you wanted to know, and it isn't anything."

"Meaning?"

"Meaning that Jerry Linton's past is a complete phoney." He paused. "To complete the report, Jerry Linton's present is also a complete phoney." Max removed a cigar from his pocket and lit it carefully. "There is no Jerry Linton. He doesn't exist. No one ever went to the moon because the space ship never got beyond the drawing boards."

Mr. Smith's silver-mounted cane dropped to the floor with a clatter. He retrieved it and sat upright.

"Please continue." The voice was distant and cold.

"Jerry Linton went to the moon via official video," said Max, "official newscasts and a grand illusion. The ham

radarscopes got nothing, amateur photographers' films were a blur unless developed at Worldwide Camera stores. There were no traces of radio activity at the rocket site; the geigers didn't even quiver."

Max took the cigar out of his mouth and blew a careful smoke ring. "The rocket experts of the late nineties have comfortable secure jobs in other industries. Where did the new experts come from and, more important, where did they go?"

Smith said in a cold voice: "Aren't your conclusions a little fantastic, Mr. Wendell? Half a million people saw the rocket blast off from Gaunt Sands rocket site."

Max laid the cigar carefully on the edge of the desk. "I can give you the name of a psych' who can induce a number of impressions on your mind which you will swear later you actually observed." He opened the morning paper. "Seen to-day's front page? Another picture of World Government, Americans, British, Russians and what have you." He pointed with his cigar. "Take a good look at the faces, all kindly, all benevolently wise, like honest justices and video mayors. No one ever heard of them before nineteen seventy six; to-day they run World Government. I've got a hunch that their records are as phoney as Jerry Linton's."

Smith rose. "Your assumptions are pure imagination, Mr. Wendell. All I required was an investigation into Linton's early life, but, for reasons of your own, you have evolved some absurd fantasy which has no bearing on my requirements whatever."

Casually Max reached into the open drawer beside him. The cold metal of the burner felt heavy and reassuring. "Sit down," he said pleasantly. "I haven't finished. Skip the bluster and try not to stall; I don't have the time."

Smith sat down slowly. The face was pale; under the moustache the mouth was a thin tight line. "You're obviously insane."

"I told you, don't bluster, and more important still, don't get ideas; I'm trigger-happy. Montrose, alias Smith, doesn't mean a thing to me; even less, dead. But you got me into

this thing and its got me edgy. I'd like a few answers before one side or the other knocks me off."

"If I knew what you were talking about——"

Max leaned across the desk and slapped the barrel of the burner into the other's face. "Don't say I didn't warn you. As I figure it I've got maybe twelve hours to live; like that it won't matter if I knock you off before I go. Ever seen a guy fried with one of these things?"

Montrose paled. His lip was swollen, blood trickled from the corner of his mouth.

"I know too much," said Max. "It's a bad thing to know too much; which is, perhaps, why I want to know the rest. Kerridge knows something. He knows this government is a phoney which gave him a good excuse to build up an underground army and have a crack at being world dictator at the same time. He was too clever to get his own people involved; he engaged muck diggers like me to do the dirty work." He ground out the butt of his cigar. "I can guess what the final pay-off was, but we won't go into that. Just tell me who runs things. Who is it capable of inducing a mass illusion so vivid that everyone believes it?"

Montrose licked his lips. "They're not human."

Max said, tightly: "So what?"

"You don't understand. We've used special cameras; they don't even look like men." His eyes were suddenly bright with fanaticism. "We've been invaded, insidiously, without being able to strike back. We're a subject race. World Government is composed entirely of aliens, and they hold every key post in the world. Every new policy and decree is brought about at their instigation. Kerridge found out. Kerridge will free mankind from alien domination!"

"Why should they want to stage the conquest of the moon?"

Montrose shrugged. "Mankind was hungering for the stars. Kerridge thinks they had to put on a show to give the illusion we are still free. Free! They stopped atomic experiments and substituted what they are pleased to call magnetic reaction motors, and that is only one example."

Max cut in sharply. "What's wrong with magno-reaction motors?"

"It's not so powerful as nuclear energy; you can't make a bomb with it, and it certainly wouldn't push a ship into space. It's a trick power to keep us tied down to Earth."

Max lit another cigar. "What does Kerridge aim to do?"

"Wipe the aliens off the face of the Earth, liberate mankind, set him free to gain the stars."

"When, and as often, as Kerridge sends suckers out to try," said Max, grimly.

Montrose said with sudden fury: "There are many knowing collaborators already. They will be destroyed. Potential collaborators will be weeded out and——"

Max said sharply: "Skip the speeches. How do they do this illusion trick?"

"They're telepathic for one thing, and they have brought hypno-techniques to a fine art. You were right; the rocket ship never left the drawing board. It came from the minds of those things via their peculiar talents. The crowds saw it, heard it, but as you, unfortunately, discovered, it never existed beyond a mass illusion."

"Why unfortunately?"

The mouth twisted unpleasantly. "You can kill me, but Kerridge knows about you. You know too much and might betray the cause. What is your life beside the liberation of enslaved humanity?"

Max walked round the desk and pushed him heavily in the chest. Montrose and the chair went over backwards against the door. "Get up and get out of here."

Montrose got. His face wasn't pretty. "Kerridge will remember this, Wendell."

Max waited a few minutes, then called a down-town number. In a few seconds Cardoni's thin Italian face filled the screen.

"You owe me two hundred and fifty," said Max.

Cardoni's face darkened. "Max, one of the kids is still sick: you gotta give me time."

Max showed his teeth. "I'll forget it and give you a free hundred. I want a sphere of kick gas."

Cardoni's face was suddenly pale and greasy. "Listen, Max, I'm on the level now. I don't make that stuff no more."

"This is for personal use. All I want is for you to deliver the stuff here as soon as you can. Another hundred if you can make it inside thirty minutes." He cut the screen to blackness.

Cardoni made it. There was sweat on his face as he placed the fragile sphere carefully on the desk. "I don't know what you want this stuff for, and I don't want to know. When you use it, insert these two capsules in your nostrils first—counteracts the gas. When your number has been out forty minutes—not a second longer—break this second sphere under his nose, otherwise you gotta corpse on your hands."

Max waited until the footsteps died away, then looked at the card the second caller had left him. He had checked, but the number was not in the directory; probably a private line. He dialled the number and found his hand unsteady. He hoped the thing that looked like a big time politician couldn't read his mind before it got into the room. He hoped it breathed oxygen. He shrugged. Too late to worry about that now.

"Yes?" said the familiar friendly voice.

"This is Wendell. You want to come over and talk to me about another job?" He had left the "vision" switched off.

"A wise decision, sir, very. I'll be right over."

Wherever the thing came from, it took ten minutes to reach the office. Max sat and sweated. Outside the window the bright Texas sun beat down on the traffic and the skyscrapers. Galveston was normal; or was it? None of the millions out there knew he was waiting to interview a big bronze man who might be——what?

The door opened and the caller entered. "And how are you feeling, sir?"

Max knocked the sphere off the edge of the desk. "You tell me."

The big man made vague pawing motions at his chest, stumbled for the chair, and fell into it.

"Don't try anything, *anything*, understand? You've taken a dose of para-gas, and if I don't break the counter-inhalant, you're a dead duck. You can't move, and I've taken a hypno-conditioning. Any attempt to induce a further hypno-impression will trigger a reaction—I'll toss this second sphere right out of the window."

The other looked at him dully. The big sunburnt friendly face was still smiling fixedly.

"You can speak," said Max, quietly, "but first you listen. This is what I know." He told him in a few clipped sentences. "Now fill in the outline."

A voice reached him, very remote, curiously whistling and unreal. "You are right in all respects, save for your inferences as to our motives. We are aliens, but we do not appear to you as such because we have hypnotically impressed the picture of normal men upon your minds. We entered your world thirty years ago. You were then on the brink of an atomic war; you are now a united world."

"Skip the propaganda. In the first place, how did you get here?"

"It is difficult to explain. We have learned to travel obliquely through the space time continuum. There were only a hundred and fifty thousand of us left, the population of one of your smaller cities—so very few of us; once we numbered millions. You see, we did not come as conquerors—we came as refugees. We are not a warlike people, and Earth was a haven."

Max said tightly: "People in these parts like to be asked first."

"Would you have accepted a hundred and fifty thousand strange creatures who only faintly resemble men?"

"Let that ride for a minute. Why did you seize power?"

"My friend, we seized nothing. Mention one true liberty we have taken from you, one change in your constitution.

All we have done is to organise the human race to protect us and themselves."

Max sat down on the edge of the desk. "You'd better tell it your way; make it fast, you've got twenty minutes."

"You look at the stars," said the whistling voice, "and you believe that one day you will conquer the galaxy, but habitable worlds are few. There are races to whom new worlds are a necessity, a question of expand or perish, and wars of unimaginable ferocity are fought for the conquest of such planets. Earth is such a world, and the universe is alive with predatory races hungry for living space. Races who would regard your nuclear weapons with much the same contempt an armoured division might feel towards a naked savage with a stone club. Yet almost every day you were broadcasting your existence by uncontrolled atomic experiments. Space is alive with robotic instruments and, sooner or later, one of your atomic rockets or nuclear explosions would have been detected. We have seen it happen time and again: the great ships dropping out of the sky, the futile defence——. Every nuclear explosion, every rocket, was a light, a signal in the darkness, a beacon for all to see, not only telling of a habitable world but broadcasting your cultural level as well."

The voice paused, then continued. "Our first task, therefore, was to protect ourselves and those among whom we had found refuge. We infiltrated to positions of power, united a world already on the verge of war and banned atomic energy. You are a young race and, like all young life forms, eager to conquer space. We gave you the illusion of Lunar conquest to appease your hunger. In a year or so we shall give the illusion of the conquest of Mars. It is so little to give in return for haven and safety."

Max said: "While you sit tight and breed and breed."

"No." The voice sounded suddenly strangely weary. "By your standards we are immortal. We have learned to live long enough to observe the birth and death of suns. When a race achieves immortality it loses the power to reproduce."

Max rose. "It sounds good, very good. It could almost be true; guess I won't live long enough to find out." He

broke the second sphere in front of the alien's face. "Guess I can't let even a thing die without a fighting chance. It should take about ten minutes for you to get back to normal; gives me a start, anyway."

"Mr. Wendell; we only inscribed a psychosis as a warning. We had no intention of harming you."

Max tightened his shoulder holster. "A lot of guys have died believing words like that. See you in hell, or wherever aliens go."

He took the elevator to the roof and flagged a taxicopter. "City airport, and gun your motor."

He had almost reached the barrier before something hard pressed into the small of his back. "Leaving the city, Mr. Wendell?" said a cold voice.

Max turned. "Well, well, Montrose, alias Smith."

"I'm afraid you'll have to postpone your trip." Montrose's mouth was a tight line.

Max looked around. At each exit were two well-dressed but obvious goons, their hands casually in their jacket pockets.

"Yes, I guess I will," said Max. "Sure you got enough men to help you?"

The hard object jerked painfully into his back.

"Get going. Look natural."

In the sleek limousine they frisked him thoroughly, and one of the goons relieved him of his burner.

Montrose lit a cigarette. "The advantage of concentrated burners," he said politely, "is the fact that they leave only ash. We're taking you out of town, and we're going to burn you down to the size of a camp fire." He leaned over suddenly and punched the other heavily in the mouth. "That's for the pistol whipping in your office."

Max spat a tooth into the lap of one of the goons and tried to grin.

The man cursed and punched him in the face.

Montrose flicked his cigarette out of the window. "We'll stop and work this guy over."

They were well out of the city now, on a little-used side road. They kicked him out as the vehicle stopped, and one of the goons jumped on him.

Montrose stepped out, holding his silver-mounted cane. "We'll use this as a start, Wendell. I believe they used to call it a horse whipping."

Max rolled over on his back, his fingers fumbling in an inner pocket for the spat gun. They'd really mistaken it for an antique lighter.

The weapon stuttered briefly as it discharged its chamber of almost microscopic explosive slugs. At close range they almost chopped Montrose in half. Max closed his eyes and waited for one of the goons to fry him with a burner.

There were sudden shouts, the high whine of copter blades, the wail of police sirens—

Max opened his eyes in time to see the bright flash of a burner. One of the goons flared suddenly as the incandescent beam hit him full in the face. He crumpled into something black and unrecognisable, and toppled over. Max passed out.

When he came round, a big policeman was bending over him. "You alright, Mr. Wendell? We got here as soon as we could."

Max looked into the ruddy concerned face and managed a painful grin. "Guess I'll live—for a while, anyway."

"We're very glad, sir." And suddenly the face slithered, lost shape, and he was looking at a thing. A thing with huge sad eyes and a kind of scarlet crest on the top of its head. "You see, we look like this," it said.

Max closed his eyes. "Go ahead and finish it. Guess I jumped out of the frying pan, huh?"

"You need medical attention immediately, sir." The voice was kind.

Max opened his eyes, and it was a policeman again, a big jovial, red-faced police lieutenant.

They put him in an air ambulance and the policeman sat by the stretcher.

"You're a brave man, sir. Galveston could use a Chief of Police like you."

"I suppose you're going to offer me the job on a silver platter," said Max, bitterly. "Do I accept before or after my funeral?"

"An application through the proper channels might bring satisfactory results," said the policeman, quietly.

Max raised himself on his elbow. "Years ago they called that collaboration."

"So I am informed." The lieutenant smiled. "To-day it might be called a form of safety insurance. When a race is struggling for maturity under discreet guidance, good incorruptible men are needed to help out. Of course, the big syndicated rackets are broken, but you would have plenty to do."

Max closed his eyes and tried to think. Kerridge promised freedom and liberation from the aliens. What kind of liberation? The kind that had plagued history time and again. Mankind pushed around, every action and thought directed by a jumped-up screaming little dictator.

On the other hand, the aliens. They'd brought about a united world inside five years. Cancer no longer existed; the great virus killers had become minor illnesses. There was no longer an anti-narcotics bureau: some sort of serum had been introduced which made that office obsolete. The high, world wide insanity figures had been cut by seventy per cent—.

Max opened his eyes and looked at the transparent roof of the ambulance copter. Evening was bringing twilight and a few pale stars were already dimly visible. He had a sudden mental picture of huge black vessels dropping suddenly from the evening sky. A city, puffing suddenly to vapour, and a primitive people fighting hopelessly for their right to live—.

He turned and shaped his swollen mouth into a grimace that was almost a grin. "How soon can I start bossing these dumb cops around?" he said.

Wrong Impression

by

H. PHILIP STRATFORD

VOSS HAD THE BRILLIANT IDEA OF TAKING
ANOTHER MAN'S PLACE. HIS PLAN WORKED
—LITERALLY

THE OUTER OFFICE WAS FULL OF THE EXCITED BABBLE from decision takers and computer operators as Voss triggered the glass doors. The noise cut as though the end of a tape had whipped through the head. Voss let his angular, sour face stare round the entire wide room, taking a vinegary delight in the rapid return to work as blonde and dark hair bent assiduously over their machines.

The intercomm said: "Mr. Voss. Mr. Mannock would like to see you right away. Mr. Voss. Mr. Mannock would like—" Over and over. It would go on until he answered.

At once he felt deflated. Mannock was the big boss and the cause of the uproar in the office because he was lucky enough, incredibly lucky, to be chosen for the next batch of candidates for the L.E. scheme. Now he was snapping his thick fingers and Voss, who was the little boss, had to go running.

He went through to the private office annexe and hungered privately inside himself as Miss McCudden looked up, startled, from her squawk box. Her wide blue eyes, as usual, made him feel awkward and scruffy, and automatically his hand went to his tie. She smiled, a prim, careful, somehow political smile.

"Oh, Mr. Voss—you didn't answer—Mr. Mannock wants to—"

"Yes. I know. He wants to discuss my taking over whilst he's away checking for the L.E. scheme. Thank you, Miss McCudden." As he walked past the girl into the inner office, leaving her with scarlet cheeks, Voss wondered why he always seemed to be rude to her, when, really, he wanted to be quite otherwise. He sighed. One day, perhaps . . .

Then Mannock's brusque efficiency drove everything, including nebulous ideas of romance, from his brain.

"I think you'll be able to handle everything okay, Voss," Mannock said crisply. "I wouldn't entrust the office to you if I didn't think so. But I wish you'd do me a favour."

"Yes, sir?"

"Put a smile on that damned long face of yours!"

Voss creased his lips. The effort hurt. He saw Mannock look quickly away and begin to pull at the lobe of his left ear. Voss felt his own frustrations, his own understanding that everyone was against him boil up in that simple gesture. Every time Mannock pulled reflectively at his left ear, Voss wanted to scream. He had tried to rationalise it out—and had done so quite satisfactorily. But he still hated the gesture and no amount of calm logic could do anything about the way he felt. He just did.

"Right, Voss. I have to catch the overnight rocket to Edinburgh, so you'll have a chance to try-out to-morrow."

"When do you go for the actual operation?"

"Shan't know that until they've taken all my measurements and my brain pattern—and you know how secret the whole thing is. Understandable, too. You'd have riots if the government didn't control the process. Still—"

"I understand," Voss said bitterly. And then, in that moment, came the realisation that he, Voss, was growing old, and growing old in the invidious position of second in command to a young man. He looked at Mannock. Worn-out, almost bald, sagging flesh, a mouth that trembled. Only the voice and eyes were firm and resolute. And Mannock

was 65. He'd worked like a maniac all his life, wrecked his health, offered up his body on the altar of progress. He'd been very clever.

The L.E. scheme had been devised for everyone, originally, and then, inevitably, had been re-oriented to cater almost exclusively for people like Mannock. Mannock was the sort of man usually described as a Captain of Industry. He was considered so valuable to the country that he could not be allowed to die of premature old age, worn out in the service of his fellow-men (that was a good one, Voss recalled the bank balances) so he must be processed in the L.E. scheme. He must be given back his youth. He must be rejuvenated so he could work further for the good of the country. It was a fine scheme, and only because so much government control was in operation could it work at all. Imagine the populace if they thought each individual member could be given back his youth! Voss didn't want that, as a good citizen; but he most certainly did want near-immortality for himself.

"All right, Voss," Mannock was saying. "Clear out now. I've one or two personal matters to attend to."

"Personal matters—" Voss stammered. Then he caught himself. "Oh, all right, sir. I'll see you when you get back." He walked to the door, then remembered. He turned on his heel and said: "Good luck."

Mannock glanced up. "What—oh, thanks, Voss. Thanks." He bent again to his work. Voss went out, already his mind a spinning wheel of desires balanced against risks balanced against gains. Then he saw Miss McCudden leaning over her desk, her body taut against her nylon blouse as she vainly attempted to reach a tape-spool that had fallen between desk and wall. Like a click of a simple switch, Voss made up his mind. And that switch triggered enough resolve to detonate ten hydrogen bombs. He swallowed.

"Miss McCudden—" She jerked upright, pushing her

hair back over her face and smoothing her rucked blouse. "Here, let me." Voss was on hands and knees, scrambling after the tape. He handed it back with a smile and she took it, an uncertain twist of her lips reminding Voss that to her he always appeared the clown.

"Thank you, Mr. Voss," she said quietly.

"That's all right—" he began, then tired of banalities. He blurted: "I hope we shall get on all right together when Mr. Mannock has left." It still sounded banal.

"I'm sure we will. Anyway, Mr. Mannock won't be away long." She glanced at him from under her lashes. "I think he'll look very fine when he's young again."

Voss knew she didn't mean 'fine'. She'd used the word deliberately. It didn't sound at all like what she meant to say.

"Why don't you say 'handsome', 'rugged', 'good-looking', Miss McCudden?" he said hoarsely. "I suppose that's all you young girls ever think of in men. There are other qualities far more important."

"I know, Mr. Voss. Mr. Mannock has those qualities, too. He wouldn't be where he is now, if he didn't have. And he wouldn't be chosen for the L.E. scheme, either." She frowned a little. "I mean to make sure I get into the L.E. scheme when I'm old." She nodded her head in decision.

Voss went off, his face pale, a pain burning in his chest. He tried to kid himself it was a passion-born pain of love and unrequited longing—then gave it up and took an indigestion tablet. He was getting old.

He saw Mannock go out to his waiting turbine-car, and almost shuddered as the big boss pulled at his left ear. Voss didn't quite shudder—he fought it down and waved good-bye, but he felt itchy all up his spine. Seeing Miss McCudden like that and being almost taunted about age and quality had made up his mind. Mannock and his damned habit of pulling at his ear finished it off.

Voss waited very impatiently for Mannock to return from Edinburgh, where the scientists and gerontologists and doctors pried into the very structure of his being. When at last Mannock strolled jauntily into his office, the state of tension between Voss and Miss McCudden was as supercharged as a thundercloud. They were calling each other 'Mr. Voss' and 'Miss McCudden' far too politely. Voss was meticulously careful not to make any slips in handing out the work—Miss McCudden was bound to put him right, with the sweetest and helpfulest little chat about "co-operation and all pulling together now that Mr. Mannock isn't here to help us all."

Voss began to wonder what he saw in the girl—and then Mannock came in the door and he saw it all in the way her eyes lit up. If they would only sparkle like that for him . . .

"Everything all right?" Mannock asked breezily. He looked ten years older, his face a wrinkled yellow mask. He flopped down in his chair, wheezing, and wiped his mouth.

"Everything all right, sir," Voss said dutifully.

"Good."

"How was it, sir?" Miss McCudden's bosom had obviously been stirred by the feebleness of Mannock. Voss could see what a pushover she would be when Mannock came striding in, with a body to match his voice and spirit.

"A little rough, but nothing I couldn't take with a bit of help. What they do, apparently," he leaned forward confidentially, "is to make a complete record of your body and mind—brain, I suppose—and then subject you to the rejuvenation field that eliminates the secreted toxins that cause old age. They told me that the more changed you become over the years, the more difficult it is to change you back to what you were in your teens." He laughed a little diffidently, coughed, and then said: "They said I was a pretty good subject—a soulless name, but then, these scientists, they're a pretty soulless lot—and they reassured me about the actual op. They said I wouldn't really notice it."

"How did they mean, sir?" Voss asked respectfully. He

kept the throbbing eagerness out of his face and voice. Poor old Mannock, he didn't know that what he was telling Voss now would be for Voss to use, not Mannock—and that was the way it ought to be. Given half a chance, Voss knew he would be much the better man than Mannock. It was so obvious.

Mannock was saying: "Why, they like to keep these things quiet, you know, and they don't like to cause embarrassment to the subjects. So you go up with an identity card and are put through the treatment and come out again without anyone apart from a nurse seeing you. They found in the early days relations had rather terrific shocks—understandable, too."

"It just shows how clever the government is to think of all these things," said Miss McCudden. "I don't think I'd like my children—when I have them, that is," she said in confusion as Mannock chuckled and Voss raised his eyebrows. "I wouldn't like them to see me change into someone younger than them—they'd have to get used to it, I mean."

"Yes, Miss McCudden," Mannock said impatiently. "Now, let's get some work done, shall we?"

The office worked hard for the following week, and Voss guessed that Mannock was driving them so that as little as possible was left for Voss to handle personally. It fitted in with his own plans, and he drove the office workers severely. He called in a young, bright accountant, Albert Ball, and groomed him to handle the every-day jobs that would keep the business functioning. Mannock's activities were wide—he controlled personally this Trust Company which in turn controlled many different types of industrial venture. Voss had a finger on the pulse of business, and as Mannock readied himself for the call from the L.E. scheme administrators, Ball, all unwittingly, was being readied for another scheme that no-one except Voss had any inkling existed. Voss felt very pleased with himself in those days, was civil to Miss McCudden—and together with those emotions was

ripped and torn by nervous anticipation and panicky fears that he would muf the whole thing.

When Mannock, pulling wryly at his left ear, called him on the morning of The Day, Voss felt as though the plug had been pulled from the well of his emotions. He became calm and completely master of himself, and listened intently as Mannock crisply outlined the day's doings.

Finally, he said: "I understand. You'll fly up alone—yes, sir. Leaving London 21.30 this evening."

"So see they send me in some dinner, Voss, and then you can clear off."

"I have some work that has to be got out, sir. I'll be working late."

"All right. But apart from the dinner, see that I'm not disturbed."

The phone began ringing as Voss went out the door, and he heard Mannock's sigh of annoyance as he switched it on. Voss went back to his desk. He noted clinically that his hands were quite steady; but they tended to dampness and he sprayed them with the anti-perspiration office machine. What, exactly, he meant to do he knew only in outline. That Mannock was going north to be rejuvenated, when by rights the recipient of that incalculable boon should be himself, Voss, was the main spur to his design.

He would take Mannock's place—what little difference there was between two lads of twenty or so was far less than would be noticeable. Who was there to recognise Mannock when he came back to the office? He had no relatives; no one who knew him as he had been was alive. That end of the problem was simple. The main trouble would be in getting into the L.E. scheme's building—and Mannock himself had told the way to do it.

By merely showing the identity card, he could be allowed in, his measurements and brain-patterns taken, processed, and let out again—a new man. And that it would be the younger Voss and not the younger Mannock that returned to London was exactly as it should be.

He wondered what Mannock had meant by saying he

was a good subject; perhaps it was just the usual expansive front that the big boss put on. Of one thing he was certain—he was just as good a subject as Mannock; better, in fact.

He sat at his desk, not working, just sitting and thinking. There was a hazy blur over the actual moment when he intended taking Mannock's place. He could visualise taking the identity card and using the turbine-car to reach the airport; he had given no thought to Mannock's reactions.

The caller buzzed, the intercomm was out of use this late in the evening, and Voss rose in surprise, for a panicky moment wondering if Mannock was able to read his designs. Then he laughed at himself and went into the private office.

Mannock had just replaced the phone, and when he turned to glare at Voss his face was not pretty.

"What's all this about you training up young Ball?"

"Training Ball? I'm not sure—" Voss began.

"Albert Ball just rang up to ask about a most secret detail. When I challenged his knowledge he cited you. I asked him one or two question then. It's pretty obvious you've been secretly training him to take over your job. Why?"

Voss just stood there, his heart hammering.

"All right, I'll tell you." Mannock stood up and began to pace up and down, breathing loudly. "You want to leave the company; but because you feel an obligation to me for the help I've given you, you don't want to leave the company in the lurch when I go up to the L.E. place." He stopped pacing and poked a forefinger into Voss's chest. "Well, I appreciate your consideration. But why leave? Surely—"

Voss chuckled. He began to laugh, perfectly normally, his emotions under perfect control. He said: "I am not leaving you, sir. On the contrary. I shall take over your position, secure your place in L.E. and myself become the new young master of the company." He didn't feel in the least mad, and he felt pretty shrewdly that Mannock knew he wasn't mad, either. It was a plan that could work.

Mannock's eyes narrowed. He took a step back.

"You can't possibly understand what you're saying, Voss. They take a lot of trouble over the rejuvenation process. Each person is different, each mould is made for a different subject, and even the scientists don't know what would happen if the wrong subject got into a mould. Do you see that?"

Voss realised that Mannock was playing for time. The big boss was moving craftily towards the desk and the phone. Voss stepped forward, meaning to push Mannock away. With the convulsive effect of a released spring, Mannock lashed out, his flying fist missing Voss by inches. The older man gasped. His face, ruddy and bloated, turned blue.

It was all over very quickly. Looking down at the crumpled figure, Voss just couldn't sort out his feelings.

He made sure that Mannock was dead. Then he rapidly transferred the dead man's papers to his own pockets and found the L.E. scheme identity card. It was a simple plastic sealed job that carried a serial number, the name, and two figures, side by side. They were 65 and 20.

Voss puzzled over them until he realised that they must mean Mannock's real age—65, and the age he had chosen to become—20. Standing in the quiet office, feeling the weight of his own 59 years, Voss experienced an overwhelming surge of excitement and mystic fanaticism in simply staring at the figures on the card. Then he thrust it into his pocket and dialled the lift.

When it came he managed, with a great deal of effort, to drag Mannock's body in and close the gates. They whined down to the garage, and the sound of the lift cut into Voss's nerves like a microtone. He was glad of the assistance of a trolley kept for the mail, and piled the corpse into the turbine-car with a gasp of relief. The car started easily, and Voss headed out into the brilliant artificial lighting of the city streets.

Mannock had kept a small private aircraft which was purely automatic: you simply closed the hatch, dialled your

destination, and left the rest to the automatic pilot and central airways control. Running out of town, the turbine a whistling rumble beneath his feet, Voss began to sew up his plan. It was foolproof.

Half a mile short of the airfield he alighted, leaving Mannock's body crumpled over the controls, and set the car to low gear. Then he ran it off the edge of a steel bridge, where it crossed an older stone bridge over a river. The car bounced twice before it splashed into the water, and on the second impact it exploded. No one was going to find that body for some time.

At the airfield he had no difficulty in boarding the plane; he would have been accepted as the second in command to Mannock if there had been any questions. As it happened, there were none, and he took that to be an omen of good fortune. The aircraft thrashed through the night sky, heading into the north and the chance of a new life.

Damn Mannock and his irritating ear-pulling, anyway. That was one mannerism the world could do without. The numbers on the identity card floated before Voss's eyes. 65 and 20. He sat up with a jerk. He did some rapid calculating and then sank back with a sigh of relief. If this process worked out by subtraction, then he'd come out at 13. With his memories and knowledge that wouldn't be any handicap. Just suppose Mannock had chosen a time that was prior to Voss's birth—Voss shied his mind away from that, was thankful to see the lights of the northern city springing up at him from the darkness.

Everything did go through smoothly, as Mannock had said it would. No doctors met him, just a smiling, efficient nurse who had never seen Mannock. She conducted him to a white-painted room with soft illumination and a bare couch rising in the centre. Voss looked at the straps.

The nurse caught the look and said swiftly: "I understand that you will be a good subject, Mr. Mannock. They must be used, but you won't need them."

Voss felt thankful about that. He climbed aboard the couch and submitted to being strapped down. Directly

above his head an intense light burned down into his eyes. It was silent and ominous and expectant in the little room. Soundlessly, a trap rolled open in the ceiling, and through the black opening Voss caught the metallic gleam of complicated apparatus. The nurse was sitting quietly against the wall, her hands folded in her lap.

"I hope they get my body impressions and memory patterns right," Voss said, trying to make a joke out of it but mainly showing off his knowledge to quell any suspicions lurking in the doctors and gerontologists above him. "I wouldn't like to forget some of the nicer times I've had."

A violet light glowed suddenly down, surrounding him in a cone of radiance. He thought the nurse had risen suddenly, a startled exclamation on her lips; but the violet light shut out the outside world. He closed his eyes, and it was as though he were sliding down a slippery mountain slope into mauve and purple darkness—

His last coherent thought was of just how clever he had been. Everything had gone smoothly. He'd return to the office, claim Miss McCudden—and take over where Man-nock had left off. It was all going to be very wonderful and he, Voss, was the most wonderful part of it all . . .

The nurse sat patiently, watching in case the patient needed assistance. She had a number of drugs, stimulants and pain-killers to administer; but it was better if the rejuvenating process went off without outside interference. So she just sat there, watching as this patient went through the agony. He should have been a good subject; but to her it appeared that he was having a very rough time indeed. It stood to reason that it was painful to re-arrange a body; but she'd almost swear that this seemed as though the body was being changed into some shape it had never had.

That, of course, was impossible. Eventually, Nurse Baracca crossed over to the sweating, pain-wracked man and injected a minimum dose. She had to repeat the action many times before the operation was finished. The

subject's record card had given no hint that there would be this reaction; quite the reverse. When they had taken his body and brain patterns on his first visit here he had looked to be a fine subject.

Nurse Baracca shook her head as the operation finished, and helped the youthful man from the couch. He swayed on his feet, then his eyes cleared. He mumbled something.

Through the wonder of this moment that never failed to move her profoundly, even though she tried to suppress it beneath an iron professional behaviour, she knew exactly what to do. They always mumbled something odd, seemingly crazy, usually what they had been thinking about just before the patterns had been taken. Sometimes it was tragic.

This one was saying: "That Miss McCudden. She talks too much. Have to dispense with her. Useless to the office and distracting to some of the staff."

The young, intense-looking man, newly risen from the couch of rebirth, lifted one hand and pulled thoughtfully at his left ear.



The Evolution of Man

by KENNETH JOHNS

Part 3—THE ACTORS APPEAR

FROM THE BEGINNING THE GREAT DRAMA OF THE EVOLUTION of Man was played on a stage of never-ending change and the actors themselves were continuously altering in the dazzling complexity of life. Species superseded species as surely as mountains were raised and eroded. For life was and is change. Life is mutation and adaption, birth and death, growth and decay, in all its myriad forms.

There was no script for the actors; but their bodies left clear records of their story embedded in the rocks, fossil records waiting millions of years to be uncovered and deciphered by palaeontologists, experts in the study of ancient life forms. To help in the understanding of the course of life on Earth there are, besides the fossil remains of long extinct creatures, living fossils who differ so little from their ancestors that one can be of more value than a thousand fossilised skeletons.

Ever since humble life-forms appeared on the face of the Earth their bodies have become incorporated in the mud of rivers and seas. There, shielded by overlying strata, they have remained undisturbed. Yet, only during the last sixty years, has there been general agreement as to the prehistoric origin of fossils. Even then, many were considered to be the skeletons of animals drowned in The Flood. Some were petrified by chemical impregnation with minerals, more were embedded in a matrix of fine sediment able to fill every hollow, whilst others were preserved in amber, peat bogs and asphalt lakes.

The continuous transformation of continents as they floated out of the denser basalt altered not only the face of the Earth but also the rocks beneath. Great folds of rock were lifted up, cut into by water and ice, and deposited in the shallow seas as silt, each stratum like a page from the book of the past.

A mile thick layer of the Earth's surface has been transformed from primeval igneous rock into sedimentary types—the salt alone from it would make a layer 450 feet thick.

In the earliest sedimentary rocks there are only a few hazy indications of the life that teemed in the seas, soft, minute creatures leaving their casts and spores embedded in silica.

If all the remains of past animal and vegetable life were dug out and burned, there would be no free oxygen left in the atmosphere: it would exactly cancel out, leaving only carbon dioxide.

Back near the beginning of life there was a split between the animal and vegetable kingdoms. Some of the bacteria-like cells developed into amoeba, crude animals able to move about by contracting and expanding their bodies into pseudopods. Also a means of catching food, their pseudopods enclosed food particles before digesting them.

Animals, including insects, reptiles, birds and fish, had one enormous advantage over the vegetable kingdom, an advantage which was eventually to lead to *Homo Sapiens* dominating the Earth. All animal life uses concentrated food as its energy source and so engages only a small fraction of its body in the absorption of food. Thus, independent of their immediate environment, animals are mobile and can become highly specialised. But all animals are parasitic and in the long run must depend on a vast area of chlorophyll-bearing plants to synthesise and store the concentrated fuel they need.

And Man is the greatest parasite of them all.

Although one worker has just claimed to have found evidence of fossilised spores in 3,300 million year old rocks from Rhodesia, little is known of life forms dating back more than 800 million years. In fact, when the first age of life, the Cambrian Period, began 520 million years ago, life had already reached a comparatively complex state.

The beginning of the Cambrian Period is marked in the rocks by the sudden appearance of fossil shells. This abrupt jump into being is not because life was non-existent prior to this period, but because only then had life developed enough to grow shells to protect soft bodies, and thus to be preserved for our study. This life did not possess backbones. It was Invertebrate and reached a high degree of complexity before being submerged by a more adaptable and successful type.

For 200 million years, during the Cambrian and the following Ordovician Period, life was prolific but confined to the seas. Where we find no fossil deposits we know that there was only barren desert-land with a few mosses and algae adapting themselves near the sea shore.

From the types of life then extant we can accurately judge the temperature and climate of the Earth. We find that the whole planet had a mild temperature with no extremes, even at the poles. This was a quiet period, with no folding of strata, the seas were shallow and warm, and occasionally heavy, monsoon-like rain drenched the land in this long early summer. In Wales, the Cambrian strata is 12,000 feet thick.

Life at the beginning of the Cambrian Period was represented by sponges, tiny protozoans with shells of silica or chalk, simple shell-fish and sea worms. Coral was growing then; but only later did it become successful enough literally to change the surface. Protozoans, elementary but successful, have continued almost unchanged to the present, and laid down the chalk deposits that were later elevated to create hills and cliffs.

Sponges began the specialisation of cells, different cells collecting and absorbing food by the filtration of sea water, and other cells utilising the food for growth and reproduction. One type of early shell-fish, the brachiopods, had already developed a digestive and a nervous system and had kidneys and specialised reproductive organs. Even 400 million years later we find brachiopods identical with their early fossilised ancestors.

Cephalopods, originators of the giant squid of to-day, were an early successful species derived from simple shell-fish. By the Ordovician Period, 420 million years ago, they had reached gigantic size. Many were over fifteen feet long. They were the first animals to develop rocket propulsion, drawing in water and ejecting it backwards.

Trilobites, forerunners of lobsters and land insects, were extremely common. The first of them were little larger than ants, but later types reached two feet in length before dying out 300 million years ago. They developed an efficient segmented shell and had compound eyes similar to those of the housefly. Their several dozen legs could be used for swimming or walking, and also were employed as jaws. They were slow, but the strength of their shells enabled them to overcome all opposition—until the evolution of fishes displaced them from the seas. Luckily, their strong shells withstood the folding and pressures of rock strata throughout hundreds of millions of years, leaving us their exquisitely beautiful fossils in uncountable numbers.

The invertebrates were successful as long as they only had competition from other invertebrates. But, mutating and growing in the seas was a strange new form of life. It had no strong clumsy shell to protect it, only a new-fangled structure called a backbone.

The development of backbones gave those animals possessing them tremendous advantages over the animals relying on the protection of external armour. Just as the

long-bowmen defeated the armoured medieval knights, so the speed and litheness of the vertebrates defeated sluggish invertebrates. The race went to the swiftest and most adaptable.

Jelly-fish, one of the earliest forms of life, had a well-developed nervous system, and from them developed the modern star-fish. The first primitive structure akin to a backbone occurring in worm-like descendants of jelly-fishes, was a cord of gristle along the back, providing support for the softer body and an anchorage for the muscles as well as protection for the main nervous cord. This notochord became enclosed in bone, and towards the end of the Silurian Period, 320 million years ago, was already recognisable as a backbone.

Unfortunately, as so often happens at moments of crucial world-importance, the early stages of this development are difficult to track, because of the absence of fossils. This change coincided with a change in the climate and a period of mountain building. The seas fell whilst the vast Caledonian mountain ranges were erected in Northern Europe. The abrupt change from the placid millions-of-years long summer accelerated the evolution of life. In the Caledonian strata are found the fossils of the early fish, primitive mud-digging vertebrates, still armoured with bony plates.

Then came the Devonian Period and the complete domination of every form of animal life by the vertebrates.

The Devonian Period opened 320 million years ago to the thunder of volcanoes and grinding of earthquakes. The surface of the Earth was adjusting itself to interior strains and the life on the Earth took a giant stride forward. The Lake District was thrust up and a mountain range stretched across the Atlantic to connect Ireland and Newfoundland.

Although the Devonian is known as the Age of Fishes, at first they gave little competition to the invertebrates,

mainly living on the muddy bottoms of estuaries and coastal flats. Then they extended their range out into the seas, losing their armour and becoming faster and more mobile. Their ability to swim long distances at speed, together with their strong jaws and teeth, enabled them to hunt living food. The trilobites found themselves no longer the hunters but the hunted. By the beginning of the Carboniferous Period, immediately following the Devonian, 275 million years ago, trilobites were extinct. They had specialised too much, and so afforded a grim warning from which few later species were to benefit.

As explosively as the volcanoes bursting through the land, fishes diverged into numerous forms to rule the oceans and rivers. Some types found in Ohio were 30 feet long, whilst the record fossil from this period is 40 feet from nose to tail. But, again and inevitably, the larger fishes were too specialised and soon became extinct.

The two types that moved out from the estuaries and were successful in the open seas were the 'gristly' fishes, forerunners of the skate and ray, and the 'bony' fishes, progenitors of the vast majority of present freshwater and sea fishes,

A small group of these bony fishes developed internal nostrils, organs that later were to develop into lungs and allow life to clamber from the womb of the seas, and, directly, to a change of environment leading to other and vastly superior types of living beings. It was the Crossopterygian fishes that began the development of lungs and, although it was once thought these had vanished from the seas, living fossils of the Crossopterygii have lately been discovered off Madagascar. These are the well-publicised coelacanths, fondly known to palaeontologists as 'Old Four-legs'.

For the few coelacanths that have been caught have

proved enormously useful in filling in the gaps in our knowledge of the evolution from water to air-breathing creatures. From a study of their anatomy it was found that coelacanths have powerful muscles and four well-developed fleshy fins which, it is believed, they use for crawling along the ocean floor—a reminder that the transition from sea to land posed as many problems in locomotion as it did in food and breathing.

The Devonian was a period of extremes in climate and weather. Intensely dry periods were followed by months of heavy rains so that life in the rivers, inland seas and lakes was forced to adapt to the periodic drying up of their natural habitat—or die. The transition was made early by sea-scorpions, their descendants surviving, evolving and spreading over the land as spiders, centipedes and, later, as flying insects before the larger animals became accustomed to breathing air.

Small fishes in inland waterways developed lungs whilst still retaining their gills, becoming lungfish types, and living fossil descendants of these, Dipnoi, are still found in the swamps of Africa, Australia and South America. Neither the lungfish nor the coelacanth are our direct ancestors; rather they are offshoots of the evolutionary tree, snared into too deep a specialisation, at a time when animal life invaded the land masses.

The most successful land invaders were amphibians. Evolving slowly, they still had to return to water to reproduce, thus being an intermediate form between true sea-dwellers and land-dwellers.

Preceding this migration by about 70 million years, plant life had already established a hold on the land. Almost 350 million years ago mosses and lichens, algae and sea weeds washed up along the tidal rocks, grew to be as much at home in the air as they were in the seas. They advanced

slowly through the marshes and gradually became inured to drier and drier surroundings, evolving roots to tap underground moisture. All the early plants propagated themselves by spores, as do ferns—flowers and seeds were efficient luxuries still hidden in the mists of the future, not due to appear for millions of years.

The spread of these early plants was slow and laborious. There was no rich soil, no nourishing dark fertile earth in which they could flourish—they had to face only barren deserts and mud-flats. From their own decaying detritus they enriched the Earth, continuing the replacement of carbon-dioxide by oxygen begun by algae in the seas.

They developed strong stems so they could stand upright, reaching for the sky and the energy-giving sun. The tallest of these primitive plants reached a height of 40 feet in the late Devonian Period, and could properly be called trees, although they were unlike anything we might regard as trees to-day.

They had no twigs—the leaves grew straight from their main branches. But, until the plants clothed the land in green, the animals had to wait before venturing out from the waters of their birth.

And then, waddling through the swamps, crashing through the plants, came the first, small, simple, daring amphibians. They were small because large bodies could not have been supported on the fumbling, embryo legs just developing from fins. They were simple because it is the unspecialised species that have the capacity to mutate and adapt successfully and so bypass the specialised species. And they were daring because, even if they had been driven out of the seas by more powerful and voracious fish, they were boldly pressing into a whole new world where development awaited them, far transcending anything to be accomplished in the mother oceans of the globe.

At the end of the Devonian Period, one of the first amphibians left his footprint in the Old Red Sandstone of Pennsylvania. The footprint stayed in the mud of time, there to be buried until 300 million years had passed and it was revealed by searching Man. Already animal life was leaving its mark on the land, a symbol of the future, when every portion of the dry earth was to be covered by the great invasion, until, at last, a descendant of those first hesitant, clumsy animals creeping over the shore was to re-shape the Earth to his own desire.

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LEGAL EAGLE



by DOUGLAS WEST

*THE LURARIAN LEGAL SYSTEM WAS PERFECTLY LOGICAL
AND PERFECTLY WORKABLE—UNTIL ARMSTRONG TURNED
INTO AN AMATEUR LAWYER*

GALLEN WAS AT PRACTICE WHEN ARMSTRONG ARRIVED. The Lurarian was a tall, lithe man in the prime of life. He danced lightly across the sanded floor of the combat-room, his body crouched in the fighter's stance as he faced his opponent. Both men glistened with salve and both held practice knives. Armstrong watched with interest as the champion moved in for the finish.

"Pretty," whispered Gallen's secretary. He licked his lips like a tiger tasting blood. "Watch the footwork."

"I'm watching."

"Note the feint, the sway, the attack." The secretary sucked in his breath as a thin line of red suddenly appeared on the sparring partner's torso. "Beautiful!"

Armstrong didn't echo the secretary's comment. He didn't see anything particularly beautiful in the spectacle of two men slashing at each other with knives, even though they were only practice blades. The weapons, he knew, were of plastic, set edge and point with a millimetre of naked steel and weighted to resemble standard combat equipment. They could inflict a scratch, nothing more, but the antiseptic salve burned as well as healed and made for caution.

"Watch!" The secretary leaned forward, his eyes glittering as they followed the swift play on the floor of the combat-room. "Oh, pretty! Pretty!"

Armstrong didn't think so. It was clever, yes, but only the trained cleverness of an intelligent animal. Had the

knives been true combat weapons the sparring partner would have been disembowelled. As it was his torso and stomach were criss-crossed with thin red lines.

"Superb!" The secretary glanced at the Terrestrial. "A symphony of co-ordinated movement culminating in complete victory. You agree?"

"It was nicely done," said Armstrong. He was being politic. Lurarians were unashamedly interested in blood sports, which probably accounted for their peculiar legal system. Visiting aliens had learned that it did not pay to express their disgust at a divergent culture.

Especially when they wanted something.

Gallen came from the combat-room, frowning as he wiped at the salve which covered his near-naked body. He was unmarked.

"Get rid of that clod." He jerked his head towards where the sparring partner stood trying to minimise the burning pain of his multiple wounds. "How can I train when opposed to such men? Victory is so easy that I run the danger of becoming over-confident." He became aware of Armstrong. "Who is this?"

"Victor Armstrong of the firm of Armstrong and Bentley," said the secretary. "They are a trading firm."

"Terrestrial?"

"Yes." Armstrong stepped forward before the secretary could answer. "But I am sure that fact doesn't bother you."

"I am a true cosmopolitan," said Gallen blandly. "I believe in the Brotherhood of Man." He lifted his arms as the secretary approached with a robe. "You watched the practice?"

"It was an honour."

"I was slow," said Gallen carelessly. "You did not see me at my best."

"I thought that you were magnificent." Armstrong recognised the inflated ego and pandered to it. "You must have trained for many years to acquire such mastery."

"All my life," admitted Gallen. He tied the robe and led the way into a rest-room, simply furnished and starkly utilitarian as befitted a spartan. A vase of flowers stood on a low table, their waxen petals filling the air with a cloying perfume. Gallen seated himself, waved Armstrong to a chair and offered a carved box of sweetmeats. "Will you join me?"

"Thank you." Armstrong accepted a sugar-crusted nut, placed it in his mouth and wished that the natives had adopted smoking as a social custom. The continual eating of sweets was affecting his waist-line.

"Another?" Gallen proffered the box. "No? A pity, these sweetmeats are especially made for me by an admirer." Slowly he selected one and popped it into his mouth. "An expert at her craft," he said with the suggestion of a smirk. "One day I may even temporarily marry her."

"The honour would overwhelm her." Armstrong was still being polite.

"Perhaps." Gallen gestured with his hand. Abruptly he changed the subject. "You wanted something?"

"A matter of business." Armstrong hesitated, then decided to be frank. "We, my firm that is, have run into a little trouble. It is the matter of a law-suit with a native firm. Trading here as we do we naturally conform to local customs and procedure. To put it briefly, will you represent us?"

"Perhaps." Gallen plucked a flower from the vase, smelled it, replaced it with exaggerated care. "Are you the plaintiff?"

"The defendant," admitted Armstrong. "The entire thing is due to a stupid error. We . . ."

"Please!" Gallen lifted one hand. "That does not concern me. My question was asked merely to determine who had the choice of weapons." He smiled. "Not that it perturbs me, you understand, but it is as well to clarify these matters. I take it that you are inexperienced with our legal procedure?"

"I am."

"I thought so. Your visit, for example, quite irregular. An intermediary should have been employed, but no matter, I am broad-minded about these things. The choice of weapons, as you are the defendant, is theirs, not yours. Is it to be to the death?"

"I don't know," said Armstrong. "The preliminary court only gave its ruling a few hours ago. I came directly here to ask if you will represent us. With you acting on our behalf we have little to fear." He paused, wondering whether to back his flattery with a monetary offer. He resisted the temptation. The champion knew his own valuation too well and would probably regard the offer as an insult.

"Before we discuss further details," said the secretary, "could we know the name of the plaintiff?"

Armstrong started; he had forgotten the presence of the small, soft-footed man, so dominant was Gallen's personality.

"Certainly. The case is being brought against us by the Lurarian Trading Company." He frowned as he saw the secretary's expression. "Why, does it matter?"

"In this case, yes." Gallen selected another flower and repeated his previous pantomime. "It matters very much. I cannot accept your case."

"Why not?" Armstrong fought down his instinctive anger at the refusal. "Is it because they are a native firm and we are Terrestrial?"

"Not at all." The champion smiled, still languid. "Justice, to me, is something pure and sacred. I would not withhold it from any race or creed for, as I mentioned, I am a true cosmopolitan. But I cannot accept your case. I have already agreed to act for your opponents."

"I see." Armstrong bit his lips, knowing that argument was useless. He rose to his feet. "Thank you for your courtesy and my apologies for any inconvenience I may have given you."

"Think nothing of it." Gallen smiled with outward

graciousness. "My secretary will escort you to the door. Good-day, Armstrong."

He reached for another flower.

Bentley was waiting in the office. He took one look at Armstrong's expression and knew the answer to his question. He asked it just the same.

"Any luck?"

"None." Armstrong flung his hat on the desk and scowled at his partner. "He's been booked by the opposition."

"That's bad." He was older than Armstrong and had lived longer on Luraria. He stared thoughtfully through the office window at the twin suns hanging in the sky. The suns and a few minor things were all that made Luraria different from Earth. "What are you going to do now?"

"Hire us another champion."

"With Gallen representing the opposition?" Bentley turned from the window and shook his head. "I doubt if we'll find one or, if we do, it will be on a posted bond, win or lose. And there's no chance of our winning."

"Optimist," sneered Arms'rong. "Are you telling me that everyone's afraid of that poseur?"

"Poseur or not, Gallen's got quite a reputation. Have you seen him in court?"

"I saw him at practice."

"Same thing. Would you tackle him?"

"Me?" Armstrong blinked. "Of course not. I wouldn't stand a chance." He strode irritably about the office. "You mean that I may have to?"

"That or cede the case by default." Bentley searched the litter of papers on the desk. He found what he was looking for beneath Armstrong's hat. "The official notification of trial came through while you were out. The plaintiffs have chosen knives, and the case is for the next sessions." He dropped the paper. "We've got three days to decide what to do."

"We'll see the Ambassador," said Arms'rong. "He should be able to help us."

He was wrong.

The Tellurian Ambassador was a man who had grown grey in the service of diplomacy and had long learned that little things must be ignored if the main object is to be reached. The main object was lasting peace and friendship between Luraria and Earth. Little things consisted of disgruntled business men. He listened to Armstrong's complaint, sighed, and helped his visitors to some of his own, imported coffee.

"I'm afraid that I can't help you," he said. "The law is quite clear and, as you reside and trade here, you must abide by it." He smiled, the ornate coffee pot poised in his hands. "After all, trial by combat isn't so very different to our own legal system."

"Like hell it isn't," snapped Armstrong. "I've never yet heard of a man being talked to death."

"The method may be different, but the results are the same." The Ambassador set down the coffee pot and helped himself to sugar. "Whether we hire lawyers to plead and argue for us or a champion to fight for us, the principles remain the same. Both systems seek to determine guilt and place liability. If anything, the local method has the advantage in that there are no long trials, no cheating judgments and no appeals. Right wins, that's all there is to it."

"Might doesn't make right," argued Armstrong. He noticed the Ambassador's pitying smile. "Well, does it?"

"It does on Luraria. If you doubt me, ask any member of the profession. Lawyers here are fighters, champions who are ready to risk their own skins on behalf of their clients." The Ambassador looked wistful. "Sometimes I wish we had the same system on Earth. It would make litigation so much simpler."

"I didn't come here to argue the merits of various legal systems," snapped Armstrong. "I came for help. How can we get out of this mess?"

"I've told you," said Bentley. He had been busy drinking coffee while the others had wasted time talking. "We

can fight—if we can hire a champion. We can fight—if one of us is willing to go to court. Or we can apologise and pay. I doubt if we can do the first. I, personally, refuse to do the second.”

“So we pay,” said Armstrong bitterly. “A hundred thousand credits and eat dirt while we hand it over. It’s a racket!”

“Not at all,” corrected the Ambassador. “It’s the law. More coffee?”

The Lurarian was very polite, but that meant nothing: Lurarians were always polite. Impoliteness could lead to an affront, a challenge and a trial to determine who was in the right. Armstrong was polite, too; he had no wish to defend his lack of courtesy in court. He handed over the cheque and made the formal apology.

“I regret that the thoughtless actions of my firm have caused inconvenience,” he said smoothly. “We acted on good faith and had no idea that the Lurarian Trading Company had already purchased sole right to the manufacture of the item in question. I can only express our deep sorrow that this incident has occurred.”

“Thank you.” The Lurarian took the cheque, examined it and looked at Armstrong.

“Something wrong?”

“The amount on the cheque is the damages claimed for violation of our sole right of manufacture,” said the Lurarian. “Said damages having been agreed at the preliminary court. But there is the matter of costs. Ten thousand credits will cover it.”

“Ten thousand!”

“Gallen is expensive,” explained the Lurarian. “Had he fought and won he would have received five times that sum, which, naturally, you would have paid. And there are other expenses.” He gestured. “An itemized account can be produced if you wish.”

“We wish,” said Bentley quickly before Armstrong could explode. “For tax assessment,” he explained. “Naturally

we shall be happy to meet your claim." He made out a cheque, signed it, passed it to Armstrong for his counter-signature, and handed it over.

"A racket!" yelled Armstrong, after their visitor had left. "A lousy racket with us as the suckers!"

"Calm down," said Bentley. "It's the system."

"Is that what you call it?" Armstrong looked murderous. "I still say it's a racket, and a sweet one at that. Look how it works. Just dream up an imagined complaint, take it to the preliminary court for official sanction, then hire the best champion you can find. Result: a hundred thousand credits clear. We should go in business for ourselves."

"It isn't as simple as that," protested Bentley. "The preliminary courts are pretty tough. Frivolous complaints don't stand a chance, and you may even have to fight the court champion in order to win the right to bring a case at all."

Armstrong scowled, not arguing, but he was thoughtful as he sat down to think about it. Outright robbery was prevented by the preliminary courts, who acted much in the capacity of a policeman and watcher of the peace. Personal combats were permitted, but organised banditry was not. Despite his anger Armstrong had to admit that, in the broad sense, the Lurarian legal system was as fair as they could make it.

Which did nothing to restore the one hundred and ten thousand credits the firm had just lost. He mentioned it, and Bentley shrugged.

"So we've taken a knock, but what of it? In this business we either go broke fast or make a fortune. We'll get it back."

"Maybe." Armstrong was pessimistic. "We can get it back, yes, but will we be allowed to keep it? Suppose someone blows the whistle on us again and we are faced with fresh litigation? What then?"

"We pay up or fight."

"So we pay up, make some more money, and the whole

thing happens over and over. Isn't there any limit on this thing?"

"How can there be? If you step out of line, or someone says that you have, then you pay up or fight." Bentley shrugged. "It's the system."

"So you keep saying." Armstrong frowned. "Couldn't we hire Gallen on retainer? Keep him on a string in case of need?"

"It's against the ethics of the profession," said Bentley.

"Ethics, hell!" Armstrong was logical. "Could we do it?"

"I doubt it. Champions always have the right to refuse any case offered. The most we could do would be to bribe him to turn down any case brought against us by any specific firm or individual." Bentley spread his hands. "Trying to cover the field would cost us more than just paying out when we have to."

"I see." Armstrong sat back. He felt deflated. "So it looks as if we've just got to sit and wait for some native firm to jump us." He clenched his hands. "Damn it! It wouldn't be so bad if we weren't so defenceless."

"Defenceless?" Bentley looked puzzled. "I don't get it. How defenceless? We've the same protection as anyone else. The law here doesn't favour native-born against alien. The system is different, but just as fair as that back home."

"Is it?" Armstrong became thoughtful. "I guess that it must be." He smiled. "I'll bet that they even have law-books, too."

"Sure they have. Why not?"

"Nothing." Armstrong's smile became wider. "Just that I've never seen a written system of rules yet which doesn't have a loophole in it somewhere." He sprang to his feet and headed for the door.

"Hey!" Bentley grabbed at his arm. "Where are you going?"

"To find that loophole," said Armstrong. He was gone before Bentley could argue.

The law-books were thick, comprehensive—and all

written in Lurarian. Armstrong cursed as he tried to wade through them, and then gave up in disgust. His speaking knowledge of the language was excellent; he could even write and read it sufficient for normal purposes, but since when have legal books been written for the understanding of the common man? And with legal phraseology being what it was, he dared take no chances on hit-or-miss translations. Not when his entire future could depend on the exact meaning of a word.

Armstrong was a man of sense; he went out and hired a professional. The lawyer, or the Lurarian equivalent, was a battle-scarred veteran of the courts who'd had the sense to quit before his slowing reflexes caught up with him.

"It's quite simple," he said. "The basic rule is that all disputes shall be tried by combat, the winner proving the justice of his case by his victory."

"I follow," said Armstrong. They were sitting in his apartment, coffee and native drinks to hand. The old lawyer had agreed to act as translator for a suitable fee, and Armstrong intended to get his money's worth. "We used to have something like that back on Earth, but it was dropped sometime in the nineteenth century, about five hundred years ago."

"You had your reasons, no doubt," said the Lurarian politely.

"Sure we did," said Armstrong. "People got hurt."

"Indeed?" The lawyer didn't say anything, but his expression left no doubt as to how he felt. He riffled pages. "What, particularly, did you wish to know?"

"The works." Armstrong settled himself deeper in his chair. "A plaintiff has the right to decide weapons, right?"

"Yes."

"Are there any restrictions on those weapons?" Armstrong sought for an analogy. "I mean, if I was the plaintiff and I said that the trial would be fought at five paces with cream puffs, would that be allowed?"

"It would be contempt of court," said the lawyer stiffly.

"All right. Then what isn't?"

"Both combatants must be in personal physical danger. Any weapons which preclude that danger are forbidden."

"So anything hard, sharp or pointed is permissible?" Armstrong nodded. "How about armour?"

"Armour precludes actual physical danger," pointed out the lawyer. "No armour."

"Proxies?"

"Proxies are permissible; that is why there are champions."

"I see." Armstrong hesitated. So far everything had been clear and above board, but he didn't know how the oldster would regard interpreting the rules to the letter instead of the spirit, and he didn't like to ask. It would be like hiring an eminent judge to find out how to work a legal swindle. He brightened as he thought about it, hoping that the Lurarian was a true counterpart of his opposite number on Earth. He probed a little deeper.

"How about non-human proxies?"

"Robots are forbidden."

"Not robots."

"Androids?" The Lurarian looked puzzled.

"Not androids, either." Armstrong smiled at his adviser. "Animals. Suppose I were to choose, say, a tiger as my proxy. Would it be allowed?"

"A tiger is a native to your planet?"

"Yes."

"In that case it would be allowed." The lawyer riffled the pages of the heavy volumes, looking, Armstrong guessed, for a precedent. "Yes, it is here, as I thought. If you choose an animal as your proxy then the defendants may oppose it with any other animal of their choice or a man with the proviso that he be armed as he wishes."

"So animal proxies are legal," said Armstrong. "Are you sure about that?"

"Certainly I am sure." The lawyer closed the book. "But if you are thinking of using an animal proxy, then I would advise against it. The defendants would be cer-

tain to choose a man who, in turn, would arm himself with a missile weapon. Your proxy wouldn't stand a chance."

"Maybe not. Read me the definition of 'animal'."

"An animal shall be defined as an entity," read the lawyer. "A being which can live as a unit, can reproduce, is mobile, displays intelligent awareness of itself and obeys the fundamental laws of survival." He looked up from the book. "As you can see, quick-growing crystals, fungi or bacteria would be forbidden."

"Thank you." Armstrong offered the native a sweet. "You asked me if a tiger was native to my planet. Why?"

"Non-native proxies are not allowed. Native, in the legal sense, means native to the planet of your birth, not merely native to the planet on which the trial is to be held."

"Interesting. Why the definition?"

"It became necessary when we were first contacted by other races," explained the lawyer. "The expanded definition enables all visitors to take full advantage of our legal system." He shook his head as a man who knows what he is talking about. "But it is a grave mistake to choose other than a man for a proxy. A fit, well-armed man can win over any animal native to any planet yet discovered."

"You think so?" Armstrong leaned back and looked at the ceiling. "Now read me the definition of 'entity'."

The lawyer did not immediately refer to the book on his lap. Instead, he stared at Armstrong with a peculiar expression.

"For an alien," he said thoughtfully, "you seem oddly interested in our legal system. May I ask why?"

Armstrong hesitated, then, remembering his analogy of the eminent judge, told him.

He was not disappointed.

Bentley was worried, not about business, but about his partner. Armstrong was spending too much time with a beaten-up old Lurarian who seemed to have been born

with a book under his arm; at least he was always consulting one. Armstrong himself seemed to have acquired a built-in grin. Bentley grabbed him one morning when he came breezing into the office. The older man waved a manifest in one hand and thrust it before Armstrong's eyes.

"See this?"

"I see it." Armstrong pushed it away and sat at his desk. "Did anything arrive for me from Earth?"

"This did." Bentley slammed down the manifest. "One crate from Brazil. What the hell, Armstrong, you trying to ruin us?" He jabbed at the manifest. "You know the freight charges on that thing?"

"Relax." Armstrong picked up the paper, pursed his lips at the sum demanded for hauling one twenty-cubic foot crate for a hundred and eighteen light years via hyperspace transmission, then resumed his smile. "Forget it, Bentley. It'll pay for itself a hundred times over."

"I hope so." Bentley didn't sound so confident. "What is it, anyway?"

"You'll find out." Armstrong winked. "How would you like to be a millionaire?"

"I'd like it very much," said Bentley dryly. "Who do I have to murder?"

"I'm serious." Armstrong grinned up at the ceiling. "A Lurarian credit is worth approximately four Terrestrial dollars. Or ten Vegan olids. Or twenty Rigelian vargas. How about that, Bentley? How would you like to be a Rigelian millionaire five times over?"

"Cut out the clowning," said Bentley tiredly. "When are you going to start doing some work?"

"I'm doing it."

"Running around with that has-been?"

"Lian?" Armstrong looked shocked. "Don't talk about our lawyer like that. Lian's a very smart man." He chuckled. "Not as smart as I am, of course, but smart just the same. I've promised him a few thousand for himself when it's all over."

"When what is all over?" Bentley restrained his im-

patience. "Just in case you've forgotten," he said mildly. "You and I are partners. Get it?"

"I haven't forgotten." Armstrong became serious. "I haven't forgotten other things, either. That hundred thousand plus we had rooked from us, for example. I'm going to get that back."

"Not by sitting on your rear, you won't."

"And not by beating my brains out trading with the natives of this sector's planets, either." Armstrong tapped his finger on the desk. "We can't beat the local set-up by playing their game with their rules. When we try it we get beaten. To make our fortune we've got to either use rules of our own or make theirs work for us."

"We can't go outside the law," said Bentley quickly. "Try that, and we'll be in real trouble."

"All right, so we do it the other way. We use their own laws to beat them." Armstrong chuckled. "We can do it, too; don't worry about that. The trouble with these people is that they've lived in a form of stasis for too long. They live by rote and never stop to think why they do what they do. It takes an outsider to break a system like that." He tapped himself on the chest. "Me."

"You must know what you're talking about," said Bentley hopelessly. "But if you do, that makes you the only one."

"Don't worry about it. Just think of being a Rigelian millionaire five times over." Armstrong picked up the paper, folded it carefully and put it into his pocket. "I'll just go and check this thing, and then we can start the legal action."

"Wait a minute!" Bentley grabbed him just as he reached the door. "What legal action?"

"The one we're going to take." Armstrong tugged at his arm. "Relax, Bentley; everything's under control."

"That's what you think." The older man led his partner back to the desk. "Now talk."

Armstrong talked.

The plaintiffs were the firm of Armstrong and Bentley; the defendants their old enemy the Lurarian Trading Com-

pany. The complaint was that the latter's advertising had thrown the products of the Terrestrial firm into disrepute and so caused loss of profits and goodwill. The damages claimed were 500,000 credits, a sum which, after much bickering, the preliminary courts had granted as equitable.

"I hope that you know what you're doing," said Bentley on the morning of the trial. "There's no backing out now. Either we win this case or go into bankruptcy."

"What can we lose?" Armstrong was philosophical. "The way things were going it was either them or us. They'd have let us recoup our losses and then, when we'd built up a financial reserve, they would have jumped us again. This way we take a gamble, with all the bets covered. We just can't lose."

"We can lose plenty," snapped Bentley. "If we lose and our assets don't meet the bill, and they don't, then we'll be sold into forced labour to make up the balance." He whitened at Armstrong's expression. "Didn't you know that? Didn't that bum lawyer tell you that if you fail in an action you lose the amount of damages claimed?"

"I knew," lied Armstrong. "But don't think about it. Everything will be all right."

"I hope so," said Bentley moodily. "What with bringing a case on such flimsy grounds, demanding so high damages and bullying the preliminary courts into granting official sanction for the trial, we'll be in real trouble unless we win." He looked at Armstrong. "You know that the opposition have hired Gallen as their champion?"

"I heard about it."

"And you're not worried?"

"Why should I be? You know the proxy we've got fighting for us."

"That's another thing." Bentley seemed determined to be pessimistic. "Suppose that our proxy isn't allowed? If we try anything illegal, then we lose the case by default. Have you thought of that?"

"I've done nothing else but think of it." Armstrong

paced the office, reviewing, for the hundredth time, the pertinent laws which he and Lian had sweated over to determine their exact meaning.

"Look, Bentley," he said. "This legal system is a static system, as I told you before. Judges here are merely referees; they make sure that the contenders keep to the letter of the law." He stabbed out his forefinger. "The letter, Bentley, remember that. If it's according to the book, then it's legal."

"Sure, but can you convince the judge that our proxy is legal?"

"Yes. As an alien firm we are allowed to use a proxy from our own planet. Our proxy fits the Lurarian definition of an animal entity. If they want to argue, I have transcripts here from leading authorities on Earth proving my point. But that won't be necessary. Lian and I have really worked on this thing, and it's fool-proof." Armstrong chuckled, then glanced at his watch. "It's time we were moving. We don't want to be late at our own funeral."

It was, Bentley thought, a poor attempt at humour.

The court consisted of tiered seats sloped back from a central arena. Within the oval space transparent partitions, usual when using non-human proxies, had been set in place. The surrounding seats were filled with sightseers and court officials. Medical orderlies stood by in case of need. It was a normal day at court.

Lian approached as the partners entered. Armstrong introduced him to Bentley and then got down to business.

"Has everything been arranged?"

"Yes." Lian glanced to where the judge sat on his ornamental dais. "I hope there won't be any trouble."

"How can there be?" Armstrong was emphatic. "You interpreted the laws yourself, remember?"

"I have only your word for it that your proxy comes within the definition," reminded Lian. "If you have misled me in any way I shall seek personal recompense."

"You haven't been misled." Armstrong glanced around the court. "Do the handlers know what to do?"

"They have been instructed."

"Good. Let's get on with the show."

Preliminaries were few. The defendants and the plaintiffs were asked the usual routine question as to whether or not they could settle their differences in a peaceful manner, a suggestion which both parties ignored. The judge repeated what they already knew, that the outcome of the trial would determine the verdict. He gave the usual warning as to the penalties attending contempt of court, waved the parties back to their seats and signalled for the champions to get ready.

Gallen, his magnificent body glistening with salve, stepped forward from the dressing rooms, posed for the benefit of the audience, and then took his weapons from his secretary. Armstrong grinned when he saw that the champion had chosen to fight with knife and rifle. He nudged Bentley in the side.

"See what he's going to fight with? Brother, is he in for a surprise." He leaned forward as his own proxy entered the arena.

Four men advanced towards the enclosure. Between them they carried a large crate which Bentley recognised as the one which had arrived from Earth a short while ago. Carefully they set it down within the enclosure and stood looking at the judge. The official signalled again, and Gallen took his place within the arena, attendants sealing the door through which he had entered after him. The four handlers did something to the top of the crate and then raced for the single remaining exit, which was sealed once they were out of the enclosure.

The trial had begun.

For a long moment nothing happened. Gallen stood tensed, his bare feet poised on the ground, his rifle at the ready as he stared at the crate. He was waiting for something to come charging out of the box and, when it did, he would shoot it. He had already assessed from the size

of the crate that the animal it contained could not be very large and, because of that, not so very dangerous. Not dangerous, that is, to a man armed with a rifle. So he waited for the thing, whatever it was, to come charging out at him.

He waited a long time. The box stood exactly as the handlers had left it. Gallen, straining his ears, couldn't even make out the sounds of breathing or movement, surely to be expected from a boxed-in animal? The silence worried him a little; he knew that the proxy was an alien life form from the Terrestrial's own planet and perhaps it was something unfamiliar and utterly vicious. He consoled himself. The box was too small to contain anything too dangerous, and the rules of combat would have ensured that the proxy came within the code.

The waiting began to get on his nerves. According to the rules governing trial by combat he had to stay within the arena until he or his opponent was vanquished. He could surrender if he wished and walk out if he wanted to, but in both cases he would lose by default. His enemy, apparently, was in no hurry to get to grips. Slowly Gallen began to shuffle forward. He was too experienced to take unnecessary chances, but he wanted to get this thing over. He lifted his rifle and took deliberate aim.

Something bit his foot.

He cursed and stamped on a small, black body, then raised the rifle again. It was bad sportsmanship and wouldn't please the crowd, but he intended firing into the box. If he aimed carefully at one corner he might force the creature, whatever it was, to show itself.

The report of the rifle echoed from the external speakers and, together with the report, the crate abruptly collapsed. The handlers had released its fastenings so that it was little more than balanced sheets of plastic. The bullet had knocked them off-balance and they fell away, revealing a mound of soil, leaves and rubbish. Gallen, after one incredulous stare, fired three times more into the mound

and then advanced cautiously to see what he was fighting.

He was surrounded before he knew it.

"Ants!" Bentley gripped Armstrong's arm. "Ants!"

"Soldier ants from Brazil," agreed Armstrong. "Just like I told you." He chuckled as a thick, black stream diverged from the ruins of the box. "They're hungry and can sense his salve. This should be good."

It was pathetic.

The champion did his best, but he was beaten before he could start. His rifle was useless: how can a man shoot ten thousand targets each under an inch in length? His knife was as bad. All he could do was to use his bare feet to trample the life from the swarming insects and his hands to beat them from his body. Inevitably some of them crawled up his legs and arms. Inevitably they bit into his flesh.

They were the big, vicious soldier ants from the Brazilian jungles. When on the march nothing living could remain in their path. Within minutes Gallen was a glistening black parody of a man staggering in blinding pain. The bite of the ants was bad enough, but it was aggravated by the burning salve. His screams and surrender echoed from the speakers.

"Save him." The judge leaned forward and pressed a button. Men darted into the arena and hosed the champion free of his tormentors. The medics moved in and carried him away.

"Justice has prevailed," said Armstrong unsteadily. Gallen had not been a pleasant sight. "We have won our case."

"I protest!" The observer for the defendants pushed himself forward. "It was a trick. The proxy used by the plaintiffs was illegal."

"Not so." Lian stepped forward. "If it please the court the proxy fit the definition of an animal, and so was legal."

"An animal?" The judge raised his eyebrows. "I would have thought that there had been more than one."

"Can we get away with it?" Bentley dabbed at the sweat on his forehead.

"It's in the bag." Armstrong relaxed. "Lian knows what to do. You see, according to the Lurarian definition of an animal we are safe. They know nothing of symbiosis and define an animal as an entity. A single ant is not an entity according to the rules. But an ant colony is. In fact, only the colony as a whole fits the definition. Lian has sworn documentation from Earth attesting that an ant colony is something more than the sum of its parts. Lurarians take a pride in their legal system and will abide by the book."

"What happens now?"

"We move," said Armstrong emphatically. "The next time they'll put in a champion armed with a flame-thrower." He looked to where the observer for the defendants scowled in defeat. "And there'll be a next time, no doubt as to that." He chuckled. "But it's given me an idea/ Maybe we can pull the same stunt somewhere else."

Bentley didn't answer. He was too busy imagining what it would be like to be a millionaire.



RECREATION

by KENNETH BULMER

*THE SCIENTISTS HAD TO BE CONFINED FOR REASONS OF SECURITY
STRANGELY ENOUGH THEY DIDN'T SEEM TO MIND A BIT.*

ALTHOUGH RALPH SWANSON HAD NO OUTSTANDING aptitude for science, beyond a definite desire for the luxuries it could bring him, and because he was possessed of that particularly adaptable and mentally chameleonlike personality which is so priceless an asset to anyone in Intelligence, he was detailed to investigate the mysterious and disquieting reports seeping out from Scortondale.

"You," the general in charge of domestic intelligence told him, "will go up to Scortondale and find out what in blazes they are playing at! No progress for three months! We can't have the taxpayers' money wasted like this."

He went up from Euston first-class and reported himself to Maddocks in the glimmering grey dusk of a Lakeland evening. Maddocks, the director of the secret establishment, greeted him politely, if with a hint of reserve, and sent him along to Doctor Toby Hawkhurst who, Swanson was given to understand, was developing some frightfully intricate new form of nuclear energy.

He had already received the impression that scientists were a clannish lot; scrambling across piles of construction materials and clayey foundation trenches, with the half-finished white concrete chimney poking over his shoulder like a blasted and withered oak, he was struck by their love of the cerie and uncommon. This might be a perfectly prosaic nuclear research establishment by day: but now, with the moon reflecting the most unlikely angles, it could as well be a scene from some Gothic opera translated not very brilliantly for the TV screen.

It was a relief to walk along the severe white corridor and knock on Hawkhurst's door. There was a muffled cry from within. Swanson pushed the door open. He was

expecting the usual spartan government bachelor-quarters, with regulation bed, desk and hard bentwood chairs positioned with mathematical precision.

He blinked and looked again. Incredible.

The jolly red-faced man must be the eminent Doctor Hawkhurst. There, any resemblance to the world of nuclear research ended. In truth, any relation to the world as Ralph Swanson knew it vanished.

The nuclear physicist was seated cross-legged on a tiger-skin. He was almost submerged in a tidal-wave of luscious femininity immodestly displayed. There was a sweet, spine-tingling odour in the air. A massive slave, all statuesque ebony skin and scarlet pantaloons, was rhythmically waving a punkah. Swanson caught the flash of light from a gigantic scimitar at his belt. A further bevy of damsels was gyrating and squirming to the insistent beat of cymbals, drums and reedy-plaintive flutes.

Swanson, as has been said, was adaptable. With a mental "Tally-ho!" he kicked the door shut behind him and started a bee-line for the lady-strewn tiger-skin.

This assignment was proving to be the most interesting yet.

Toby Hawkhurst looked up from the gazelle eyes of an houri, a frown shadowing his open face. He said: "Oh, damn!" He did something at his belt.

Swanson, his alert eyes fixed on a red-head with outstanding qualities fully displayed, pulled up awkwardly. He stood as though paralysed on one leg, the other extended stiffly before him. His face was expressive of the utmost consternation.

The room was chillingly empty of houris, slaves, punkah and tiger-skins. Four-square in their place, uncompromising and earthly, were bed, desk and hard, bentwood chair.

Swanson said: "Gaah!" Not, perhaps, the most intelligent thing in the world to say; but, under the circumstances, eminently pardonable.

"Hullo," said Toby Hawkhurst. "Want something?"

Swanson tried to speak again. His mouth moved. He swallowed.

"I say," said Toby Hawkhurst. "You'll get cramp if you stand like that for very long."

Swanson put his foot to the floor. He took a deep breath.

He managed to speak. "Look here," he said indignantly. "I can stand to see a scene of debauchery out of the Arabian Nights when I'm least expecting it. In fact, I'm prepared, under certain conditions, of course, to join in." He shook a finger at Hawkhurst. "But I must say it is pretty thick when it all goes up in a puff of smoke before I'm even introduced."

"Sorry, old boy," Hawkhurst said, smiling secretly. "'Fraid I don't know what you're talking about."

Swanson's face took on a hard look. He advanced a step. "You were sitting on a tiger-skin rug, with a baker's dozen of houris on your lap!"

"I say, old chap," Hawkhurst said, not at all discomposed. "I know I'm putting on weight. But a baker's dozen—on my lap—well, have a heart!"

"Don't prevaricate," Swanson snapped. "Do you deny you were sitting here with—well, I won't detail it all again. But do you deny it?"

"Of course, old fellow. Everything. Have a drink?"

"What?" Swanson was taken aback. "Oh. Yes, thanks."

The telephone rang.

Hawkhurst picked it up and listened. Then he smiled.

"Righto, sir. It's all right. But you might have warned me." He put the receiver down.

"Connivance," said Swanson. "Who was that?"

Hawkhurst poured out a whisky. As he handed it to Swanson he said: "What's it got to do with you? Look here, who are you? What do you want bursting into my room at this time of night?"

"Name's Swanson." He put over the cover he was using. "Revenue officer. Checking up where the money goes."

"Well, it's no good asking me, old boy. I'm always broke." Hawkhurst finished his drink. His hand played with his belt buckle and then, almost guiltily and, so Swanson observed, very reluctantly, he released it and put his hand in his trousers pocket.

Swanson decided to inspect that belt buckle later. He remembered that Hawkhurst had touched it before the chorus from the Arabian Nights had vanished. He was a very practical man. It didn't occur to him that he had had hallucinations.

"Well, if that's all for to-night—" said Hawkhurst.

Swanson realised that he was being asked to explain his visit—or get out. Changing his tactics, he elected to leave.

"Good night, Hawkhurst," he said.

"Oh, good night, old boy. Happy dreams."

That he would have to change his entire plan of campaign was immediately obvious to Swanson. That public funds were being misappropriated was painfully clear. Whoever were the girls brought in by Hawkhurst and their posturing ebony-skinned manservant, and wherever they came from, one thing was for sure—they had to be paid. And Swanson objected strenuously to paying 19s. 6d. in the pound for the debased pleasures of nuclear physicists.

"I suppose you'll be allowed back in London," Madocks said the following morning in the director's office. "You're lucky. We've been cooped up here for three years."

"No leave?" asked Swanson, surprised.

"Government don't believe in it for our sort," Madocks said. "We know too much." He didn't appear to be too upset, Swanson noticed.

"What's holding up production?"

"This and that. Care to walk around the plant?"

"I'd like that." Swanson rose. There might be a chance he would happen on the hiding place—for that was what it must be—where these cloistered scientific monks kept their lady friends.

At dinner, after an exhausting morning climbing over monstrous concrete and steel structures, peering down into crazily remote basements and inching perilously above rooms filled with the dials and meters of nucleonic science, Swanson had not so much as seen a flutter of a petticoat.

He ate his roast beef and Yorkshire with little enjoy-

ment. Subterfuge, he had decided regretfully, would have to provide the answer. Following the line of least resistance, he pleaded fatigue and a headache and retired to his room at eight o'clock. He lay on the bed smoking until half-past nine. He then rose, donned sneakers, a thick sweater and old slacks, picked up a torch and crept out.

His door was locked.

Baffled, he stood thwacking the torch against his thigh. The window. Before he had reached it he mentally stepped up his attack on the problem another notch. With the door locked, five would get him ten the window would be either locked or booby-trapped.

The chief of home intelligence had not picked Swanson without good reason. The agent lifted down the window frame and placed it neatly beside the withdrawn screws. He felt along the sill with delicate fingers. The alarm was essentially a simple thing. A photo-electric eye which would be cut if a body went through the window.

Swanson was careful of the flex as he lowered the photo-electric cell embedded in the frame to the floor. He chuckled slightly. The thing could maintain its invisible vigilance, leaning against the wall, all night; certainly, he wouldn't cut it, going through the opening where the window had been.

There was little trouble finding Hawkhurst's room tonight. At this late hour, the fun was warming up.

An anticipatory relish thickening in his throat, Swanson crept along by the outside wall, listening to the blood-stirring thump of cymbals and drums. This was going to be most instructive—and, of course, would, *inter alia*, save the taxpayers' money.

He must have cut another alarm.

The sounds of revelry ceased. The square of orange light dimmed, vanished. Swanson cursed. There was nothing for it now but to go on. The fruits might be fallen; the branch must be dealt with.

The silent sounds of the night breaking over the moonlit impermanency of the site recalled, with something of a shock, that he had not been acting completely as an Intel-

ligence Agent should. That first unbelievable sight of the harem, clustering around a professor of physics, had unbalanced him, thrown him helter-skelter into a half-mystical world of fantasy. Since then he'd gone along in much the same spirit he had during a dream-sequence; half believing and half reluctant to part completely with self.

Deliberately, he stiffened his upper lip.

Peering in through Hawkhurst's window he could see nothing. He bit his lip in thought. Then, acting the part of discretion, he retired to his own room.

Hearing sounds and the casual voice upraised in a laugh coming from the mess room, he swerved off in that direction. Then he paused again. He had successfully evaded the security watch put on him once: why tip off his hand? If he expected to do anything spectacular among these infernally clever scientists, he must catch them in the act.

He crept along to his own room, replaced the window and frame, and went to bed. He slept soundly.

The next day was spent in much the same way as the one previous. Maddocks, over dinner of fresh salmon, was vaguely triumphant. Swanson regarded him thoughtfully.

"You tell me no-one has been out of here for three years?"

"That's right. Not a living soul."

"You must find it boring?"

"We manage," Maddocks said. Then he added with another of those sideways looks: "Our work, you know. Very absorbing."

"Very," agreed Swanson dryly. He pushed his plate to one side. "I suppose you can't tell me what you're doing here?"

"Not unless you're prepared to stay here with us, indefinitely. No?" He laughed a little scornfully. "I thought not. We had a man up once to tune the piano in the mess. He happened to overhear a couple of physicists talking about—well, discussing their work. We couldn't let him out after that, of course."

"You mean he's still here?"

"Naturally. He spends most of his time tuning the piano. His wife was most upset. She spent six months in the Ministry waiting-rooms before she realised it was hopeless. He writes to her occasionally."

"But—but—" Swanson could only splutter.

"He adjusted, in time," Maddocks said, drinking a glass of water and then standing up. "He found . . . other compensations. Well, I must be getting along."

"Other compensations," Swanson said to himself, prowling the site like a lost soul. No doubt they had the best tuned piano in all of England here; but they evidently preferred the thump and jangle of cymbals, drums and reed pipes. Swanson made up his mind to get to the bottom of this. Partly because of the taxpayers' money and because it was his job; partly because he hated to be kept in the dark when anything that might be interesting was going on.

He removed his entire window again that night, and, plimsolled and jerseyed and armed with a torch, made off by a circuitous route to the window that, the previous night, had blazed with light and revelry. Halfway across the central space, with the long low mess building on his right, he bumped into the dark figure of a man.

"Ah!" Swanson said, seizing the man by the coat collar. "Got you!"

The man uttered a surprised gasp. He struggled and then, as though realising he had no chance against as tough an adversary as the Intelligence agent, went limp. His hands moved at his waist.

A ruddy glow flickered upon Swanson's face. Around him rose the beast cries of men, chanting and singing wild dirges. The maddening cadence of drums thundered upon the hot stickiness of the night. He looked about him amazed, his hands slackening upon his prisoner's coat.

Erected in a tremendous circle rose gigantic, hoary stones, lichen covered, grinning with age. Torches of aromatic woods smoked and flared from every niche and cranny. In that demented light he saw the face of Hawk-

hurst, standing at his shoulder. The physicist's features were convulsed by a fear all the more shocking to Swanson in that he knew he did not possess all the details of whatever horror they were confronting. The smell of death was in the air.

"Where are we?" shrieked Swanson. "What have you done?"

"Mistake," chattered Hawkhurst. "Too many lines."

A ringing, many-throated cry rose to the pale stars.

Turning on his heel, attracted despite himself by the sheer vehemence of the shout, Swanson saw an altar, dark stained, a procession of white-robed men. He saw the naked, nubile body, the curve of flesh, the downward sweep of great jagged knife, the hot rich spurt of blood.

Then Hawkhurst, clutching his arm, had fumbled with his belt again. In a twinkling they were standing on a heathland, the cool night breeze chilling their feverish brows. Around them, in every direction, stretched the twinkling campfires of a great army.

Before Swanson could collect his scattered senses, men in mail stalked by. Hawkhurst drew him into a clump of bushes. The armoured men, clanking grimly, strode on. Their voices, thick with a brogue that defied rapid identification, drifted on the breeze.

"Ay, 'twill be a bonny fecht."

"If the judges allow the Frankish thunderbolts, our English heat-rays should do well in the press."

"Mark the Bourbon standard well. The Duke, 'tis rumoured, has been buying Burgundian gasmasks."

"The King would ne'er hae truck with poison gas . . ."

The voices drifted away, to become lost in the horse-champing and mutter of a mighty host watchful on the eve of battle.

"What in the name of all that's holy goes on?" demanded Swanson. He turned on Hawkhurst with the fury of the devil. "Look here! Tell me what this is all about! Those armoured men didn't make sense—"

"Yes they did," Hawkhurst said warily. His hand went to his belt again. This time Swanson shut his eyes. When he opened them he and the physicist were barely in time

to dodge the racketting, careering onslaught of torrents of horsemen.

Small, crooked backed men, with bent legs hooked under their ponies' bellies. Horsetails flared on poles at their head. Fur caps covered round skulls and their eyes were like discs of lurid fire.

"Mongols—Huns—am I dreaming?" Swanson said wildly. He caught Hawkhurst's arm in a steely grip.

"No, man. I wish you were. This comes of your meddling." Hawkhurst was sweating, his face livid in the light of the newly-risen moon. "We're stranded! Lost in the dimensions!" His hand went towards his belt again.

Swanson gripped the hand firmly.

"Wait a bit! You might plunge us into the middle of a battle in the Civil War. Or you might drop us smack in the centre of a hydrogen bomb of the future!"

"No, you fool!" Hawkhurst was trying to calm himself. "We're not travelling in time. These are parallel existences with ours. Worlds that might have been, if history had taken a different turn from that we know."

"Those horses smelt pretty real to me."

"Precisely. They were, in this world. This world is one where Attila didn't lose to Aetius at Chalons, I shouldn't wonder. Since 451 they've not changed a great deal in their nomadic ways of living, amalgamations with other Tartar tribes, strengthening their grip on the world—you saw the horse-tail banners. The Khans are riding again—in this dimension!"

"I'm passionately devoted to history," said Swanson, looking nervously about in the darkness. "But just at the moment I'm more interested in getting back home."

"So am I. I'm trying to do it. But your blundering attack in the site startled me and I set the dials too far over."

"My blundering attack?" Swanson said coldly. "I'm interested to know what's been going on in Scortondale over the past few months. It's a pretty sure bet it's had nothing to do with the research the government are paying you for—"

"Look out!" shouted Hawkhurst. Swanson heard the

roar of innumerable horses' hooves. He jumped on Hawkhurst as the physicist twiddled his belt dial. The roar and smell vanished.

Both men sat up, breathing heavily. The abrupt fall as they struck the ground had winded Swanson. He stared about, apprehensive and yet filled with a surging glow of anticipation. What was this new world they had entered? How did it differ from his own?

Under the impact of what had happened he accepted Hawkhurst's explanation of dimensional travel completely. After all—he was here, wasn't he?

Wherever here was, it was certainly very quiet.

Not a sound disturbed the air; not a single bird or insect note. Very faintly away to the East Swanson thought he could see a flush of apricot in the sky. The birds should be in full chorus now—the dawn oratorios always began an hour or so before the sun. Utter silence.

Hawkhurst nudged him in the ribs. As Swanson turned he saw the familiar belt buckle movement. He was about to protest that this headlong flight through the dimension without a goal was futile when he was abruptly plunged once more into a quiet early morning pre-dawn hush. This time, however, the small sounds drifting out of the velvet purple air were reassuring.

Hawkhurst said gravely: "That's just one of the dangers." He lifted a badge on his lapel so that Swanson could see the discolouration spreading over the tell-tale.

Swanson did not need to be told what had happened to *that* world.

"Where are we now?" he asked, to break the tension.

Hawkhurst moved his fat shoulders. "I know where I'd like to be. Safe back at Scortondale in bed."

"What, exactly, have you done?" asked Swanson. "We might as well sit here now and wait for the dawn."

"Done? Why, developed a deviation-energy cell. You insert yourself between the dimension lines instead of following just one. You know, of course, the theory that every time a world event of significance takes place with more than one possibility hinging on it, enough different time

tracks branch from that nodal point? You do—well, enough tracks branch off to make even your grandfather's time incredibly remote. Suppose no-one had realised just what power there was in steam? Suppose oil was still being used to burn in lamps and no-one had spent years cracking it down into petrol? Different world, different situations, same people, old boy."

Hawkhurst had perked up. A short discourse on his favourite subject and the growing light in the East combined to restore his confidence. He stood up and stretched.

"Can you get us back to our world?" Swanson said dubiously. "These places seem pretty remote."

"Once I recognise landmarks, I think so. The world you copped me in was one I often transfer for the boys."

"You mean there are others in on this?"

"Of course." Hawkhurst was amused. "Suppose Charles Martel hadn't whacked the Moslems at Tours in 732. He was Charlemagne's grandfather, ergo, no Charlemagne. And the Mussulmen would have gone on unchecked, Spain and the rest of Europe would never have got rid of them. In fact, by this time, we'd all have been good Moslems." Hawkhurst chuckled reminiscently.

"As I observed when I called on you," Swanson said.

"Precisely, old boy. There's a sumptuous palace set up on the Scortondale site. All the fellows go there off duty."

"The whole secret nuclear research establishment?"

"The whole boiling, old chap. We've even got a piano in there."

"I bet it's in tune," Swanson said bitterly.

"Of course, of course." Hawkhurst stared across the ground towards the far-off mountains showing in the morning light. "Fellow's thanked us no-end for keeping him here."

"Well," Swanson said briskly. "We can't hang about here. Let's get back."

"I'm trying to visualise the pattern," Hawkhurst said thoughtfully. "Those Druidic bully-boys must have channelled off pretty early to remain as static as that. And the Huns and Mongols would have attained an ascendancy before the Moslems did—even with Genghis coming after

the Hegira. Yes, I think we need to go this way." He moved his belt buckle.

As they swished through the dimensions, Swanson had an uneasy feeling. Those men in armour, talking almost unintelligibly about modern weapons—and more than modern—in terms of the time of chivalry. As though they rode down the lists on their chargers, clad in plate-mail and wielding tommy-guns. That must have been no single-event change.

He opened his eyes to find himself standing upon a series of small earthly mounds. Not a tree was in sight, merely ferny bracken and mosses and lichens.

"Look, Hawkhurst," Swanson said with the uncertainty of a layman treading upon a professional's ground. "Those men in armour. They must have branched out after the Huns. And there wouldn't have been a single battle affecting the probability line. More likely a synthesis of the feudal and chivalric system with the coming of gunpowder, instead, as in our time-line, the crushing of one by the effect of the other."

"It wasn't only gunpowder that smashed up chivalry," Hawkhurst was beginning to say when he suddenly jumped into the air and began shouting and beating at his ankles.

At the same moment Swanson felt a million tiny needles sticking into his own ankles above the slippers. He leaped wildly and looked down.

Running and tumbling in every direction, pouring from the earthy mounds and hastening in rivers and floods of shiny black were more ants than Swanson had ever seen in his whole life before.

"Ants!" Hawkhurst yelled. He began to run frantically in all directions.

Swanson shrieked in terror and pursued him. If he twisted his belt buckle and left Swanson here, in this world where ants were Lords of Creation—! Swanson hurled himself at Hawkhurst. The stinging in his ankles had not stopped.

As both men crashed to the ground, scattering upturned earth and ants in a shower, the prickling intensified and spread over every uncovered portion of skin.

Screaming with agony, Hawkhurst twisted his belt buckle.

They were both floundering on soft, spongy soil. In their nostrils was the stink of rotting vegetation and water swirled away in oily ripples from their thrashing feet.

The water soothed the sharp agony. After a time they crawled onto a mudbank and lay, gasping and recovering their equanimity. Swanson began to examine his legs.

"I say, Hawkhurst," he exclaimed, shocked. He plucked something from his skin. "Look at this."

On his palm, wet and shining, lay a perfectly formed artillery shell. It was perhaps a millimetre in length, just visible against the white of a crease in Swanson's palm.

"And look at our skins."

Over the surface of the exposed portions of their anatomy what appeared to be a rash had formed, consisting of hundreds of minute ulcers.

"They're not ulcers," Swanson declared, his head spinning. "They're shell-holes!"

"Intelligent ants." Hawkhurst's hand did not stray from his belt buckle. "That shell you picked up must have been a dud, or caught in your hair." He wiped his face. It was growing oppressively warm and sultry.

"I told you we were going the wrong way," complained Swanson.

"I realised that; this world is somewhere nearer to ours."

As he spoke a high-pitched whistle, for all the world like a knocking-off whistle, pierced the heavy ferns. The water surged up the mudbank, threatening to spill them into the greasy channel. A brilliantly coloured head emerged from the vegetation. The head was as big as an Austin Seven and was upside down. Its eyes, big as the car's wheels, were dull and dead. The body followed. The body was scaly, brightly coloured, as large as the Flying Scotsman and was being carried in the jaws of another, larger, head.

Swanson hung onto Hawkhurst and jittered. Neither of them bothered to say anything. The physicist twisted his belt buckle all the way and they were off, flying through the dimensions.

Halfway along the flight Swanson felt a slowing down

sensation. Then he and Hawkhurst were standing on a bare, windblown ridge which a moment before had been the mudbank, staring down over a steel city that stretched to the horizon.

"Power pack getting weak," said Hawkhurst desperately.

"Well, get as near our time as you can. We'll find someone with power to give us the last boost. Only hurry."

The flashing experience of shooting through the dimension was succeeded by a calm, tranquil feeling of utter relaxation. They were standing on a concrete apron, with a bare, ugly outline around them. Over to one side a new, unfinished chimney stuck up like—Swanson fondly remembered—a sere and blasted oak.

"You're not going to tell the government about our little off-duty relaxation, are you?" enquired Toby Hawkhurst anxiously. "You see," he went on desperately, "when you're condemned to spend the rest of your working-life cooped up without being allowed out—well, as scientists, we found another way out, to secure rest periods off-duty." He finished pleadingly: "Strictly off-duty, I assure you."

In the dawn light men were marching from a building towards a flagpole. Interested, Swanson watched the bundle of bunting rise to the top.

He said: "No, I think the government needn't know, provided you all push ahead with the work. It's been dropping behind schedule lately." His eyes swivelled towards Hawkhurst. In their depths a calculating light gleamed. "Luckily we arrived before the batteries failed."

"Oh, I think people near our time-line would give us a little power with pleasure," Hawkhurst said carefully. He went on: "So you won't squeal on us, old boy—?"

"Provided I can share your palace and the . . . tiger-skin rug."

"Done, old boy!" Hawkhurst was beaming. "Here's my hand on it!" They were both smiling now as they watched the flag unfurl in the morning sunshine.

They were laughing very merrily as the red and black and white of the swastika fluttered in the gentle morning breeze.

An Affair of Gravity

by S. D. HILL

*IN WHICH A NEW AUTHOR MAKES WHAT COULD BE
AN UNPARDONABLE PUN*

IF YOU LOOK IN LICHTER'S 'HANDBOOK OF GREAT SCIENTIFIC Discoveries', and turn to page two-twenty-four, you'll find the heading, 'Anti-gravity'. Under that heading, you'll see the sentence: 'First discovered by Holtz and Schiemer, 2044.' It's eyewash! Don't believe a word of it. It should read: 'First discovered by Conway and Bliester, 2043.' Unquote! Let me tell you why.

Conway was my buddy over at Dingle Academy. "Bliester," he used to say to me, "if all the discoveries I've made were published, and acted upon, the world's scientists could pack up and take a vacation for the rest of eternity."

I believed him too. What he did in science, most other scientists have forgotten. Thus they forgot him.

At Dingle Ac., we trod, or maybe limped, the path of experimental physics, and our problem was gravity—pure down to earth gravity, if you'll pardon the pun.

We studied the problem of anti-gravity, our main concern being to beat the National College boys, viz: Holtz and Schiemer, in the race for its discovery. Those were our orders from Doctor Dingle himself, and when the good Doctor spoke—we shivered, for he wasn't the kind of guy to go back on the poison that shone in his eyes. So, we started to work.

At least, Conway worked. I just acted as his police system, keeping my spies working hard on finding how our rivals were getting on, and planning counter-espionage, for they, too, had their dogs onto us. This fraternity amongst intelligent beings is a trying game, especially for the police system, and I had my work cut out setting up my security screen. However, for a time it ran well, and our academic studies went unhindered.

"Bliester," said Conway one drizzling afternoon, "I don't like it!"

I glanced out at the rain running down the window. "Sure is a dirty day," I agreed.

He got up and paced back and forward between the scarred and stained benches of the lab.

"I don't mean the weather," he snapped, "I mean the way this problem is going."

I stifled a yawn. He was right; the problem of anti-gravity was as near solution as the day we started on it.

"I'm tired," I said, "what do you say to us leaving early today?"

"We left early yesterday," he said, still pacing, "and the day before that, and the day before that. No, I think the time has come to make a grand overhaul of the work to date."

I shrugged. I didn't say that we had just overhauled five months' work by burning the lot. Instead, I put my feet up on a bench, closed my eyes and thought about a certain Gloria Jones, a dish, a honey, who was in the habit of calling round to my digs and cheering me up on occasions. I sighed, and then Conway woke me from my day dream with a hearty crack across my legs.

"Maybe you're right," he cried. "Maybe we should pack up and go away for a few days and have a rest. New surroundings! New air! Then we come back and poof—we beat Holtz and Schiemer like that!"

He strode up and down even faster, his hands and legs twitching in the way they did when he was being bright. I rubbed my thigh.

"Do you think the Doc would mind?"

"The Doc won't know," he answered. "We'll put it down to field experiments. You look after the security, eh?"

I shrugged. He was the boss. That night, in the digs, Conway sat sprawled over a huge coloured map, whilst I sat in awe beside Gloria.

"You know," Conway said, breaking the silence, "I think we should find some place right out of the way. Bliester, come and stick a pin in the map."

Still lost in the wonder of Miss Jones's eyes, I plunged

the pin into the map. I never even noticed where the point had gone. Conway turned it round.

"Blenchlyford," he read, "should do. O.K. folks, that's it—we go to—to Blenchlyford."

My only one sorrow was that Conway found no part in our holiday for Gloria. I pleaded and begged on my knees, but he was adamant. So it was that I left the little lady on the campus, and followed Conway as he discreetly faded from sight. So we came into Blenchlyford, a one-eyed estaminet in the south.

The village itself lay tucked away in a great belt of green woods and meadowland, not more than twenty houses in a main street, with outlying cottages and farmyards. For the first time in our partnership, Conway congratulated me on the place, for its peace and quiet, its ability to soothe the weary mind, but in the next breath he informed me that it was sheer luck that I had picked it. I shrugged and settled down to a few days of boredom.

Not so Conway, for he was set on meandering over the countryside, bent on taking the fresh air and seeing nature in the raw. So, whenever he saw a break in the overcast clouds, he would push me out of our damp, musty smelling digs, to roam in the cowgirls' paradise that was Blenchlyford.

We forgot about physics. Conway extolled upon his knowledge of botany, sex and cheese-soufflé, which he informed me over and over was his masterpiece. I listened with half an ear, yawned a lot, and let him talk. Then, on the third morning of our visit, it happened.

As usual, we were meandering along in the style of gentlemen of leisure, when it came on to rain again. We were in a little wood about three miles from the village, and stood getting soaked, deciding where to shelter.

"Which way do we go?" I asked peevishly, turning up my coat collar.

"No good going back the way we came," Conway answered. "The woods end just down there—no cover. Let's go further in and find a place."

We trod carefully through the piles of now soaking grass

and ferns, wetting ourselves more so, until we came out into a little clearing. Suddenly Conway stopped dead, and I saw that he was staring into the bushes away to our right, his eyes bulging as though he was choking, every muscle in his body still, which was quite an achievement for him. I followed his eyes and saw what appeared to be a farm tractor, pulled into the trees and standing on a little rise in the ground. I tapped Conway on the shoulder.

"What's the matter?" I asked. "Why have you stopped here? I'm getting wet."

The rain was bouncing off the trees in great drops, each one laughing with glee as it slid down my open shirt. My feet began to sink slowly into the sticky morass underneath, and deep within my dampened mind I began to find the whole situation very silly, especially as Conway continued to stare at the contraption that to me appeared quite normal.

"Look," he whispered, "and tell me what you see."

I shaded the rain from my eyes and stared hard.

"I see what appears to be a tractor," I said gravely, "standing on a ridge and getting as wet as I am in this confounded rain. Should I bow down to it?"

"Maybe we should," he said, twitching all over. "Maybe we should."

Slowly he started to creep towards the thing, striking the attitude of a wild animal about to spring, the rain spattering off him in a great stream as he got into the open. I fully expected the engine to rear up roaring with fear. However, it didn't, and I stood watching him, feeling very foolish and getting wetter and wetter.

Conway stopped about three feet from the tractor, regarded it in silence for a moment, his body jerking spasmodically, then he reached out and dramatically pulled away the foliage that screened the lower half of it. As the engine came fully revealed, I felt my eyeballs start in their sockets, and a tingle ran up my spine. I gasped aloud, for the thing was not standing on a rise in the ground at all—it was standing on nothing; just suspended in the air about three feet up, with nothing to support it!

A closer look confirmed my earlier impression. It was up in the air all right, with nothing under it and nothing over it—just up!

Conway got down on his knees and crawled under it, the sticky wet grass soaking his already wet pants. Then he climbed on top of it, feeling about the surface as though it would bite, his eyes still like those of a broody hen. I surveyed his actions with mixed feelings, still doubting my senses, until he suddenly jumped down onto my feet, causing me to slide about in the mud with pain.

"This is it!" he cried capering about. "This, Bliester, is it! Anti-gravity!"

I wrung the water out of my pants and shook my head.

"Now don't get jumping to conclusions," I grunted. "This thing probably has a perfectly logical solution."

"Don't talk wet!" he snapped.

"I can't help talking that way in this weath—"

"Cut the gags," he said. "This is genuine! Take a look for yourself. This thing is in space; air; up. It's got no visible support."

I took a closer look just to satisfy him, but he grabbed my collar and threw me underneath it. I slid right out the other side over the wet grass. Then he grabbed me again and tossed me up onto it. Taken unawares, I sailed majestically over the top and dropped into the ferns on the other side. I sat up shaking the water from my hair.

"O.K.?" he demanded.

"Sure," I answered. "Your practical demonstration proves it. Anti-gravity. So? What do we do now?"

He stared at me as though I had suddenly become a loathsome insect.

"First," he said, starting to pace up and down, "I believe the National Coll. boys are here. If they are, then they've beaten us. Secondly, we steal it and drive hell for the high wind back to Dingle Ac. Thirdly, you're my security boy, and I'm going to break your neck for not doing your job in watching them."

"Honestly, Conway," I said backing away from him, "the

National boys are no nearer the solution than we are. I don't know what this is—but it isn't them."

Conway narrowed his eyes, then turned and regarded the engine, his body twitching again as his thinking powers worked overtime. I sat down on a tree stump and watched him pace slowly round the engine, the circle ending right in front of me.

"Bliester," he said, "if this isn't the boys, then we've stumbled on something bigger than both of us!"

I shrugged, then a thought struck me.

"Look, Conway," I said. "Remember it was my doing that we came here in the first place. Give credit where due."

He patted me on the shoulder, and was about to answer when I heard a movement in the bushes not far off. I gripped his arm, but before we could hide anywhere the trees parted and an old, old man appeared and eyed us with bright beady little orbs from the most wrinkled face I've ever seen. A prune would have passed as a grape beside this old fellow. He was small, and by the way his clothes fitted, I guessed he was wrinkled right down to his bones. The clothes, however, seemed quite normal, a long coat, tight trousers, and a high wing collar. Yet he wasn't wet! The rain seemed to miss him altogether, an operation that appealed to my soggy senses.

Conway moved as though to hide the sight of the elevated machine from the old man, thus preventing a third party risk, but Methuselah pushed past my friend and tinkered with a wheel that stuck out from the side. Conway raised his eyebrows at me then turned to the man and nodded.

"This yours, Dad?" he asked.

The old man grinned toothlessly and chuckled.

"Yep! Nice job, eh?"

I fell back in surprise, for somehow I didn't expect him to speak English.

"Tell me," Conway said. "Why doesn't she come down?"

"Can't," replied the old man. "Not before I've fixed her underneath."

He disappeared suddenly under the belly of the machine,

his thin legs sticking forlornly out at me. Conway ran round the other side, obviously to the man's head.

"Say," he cried. "How does she stay up?"

The legs my side wriggled, stretched, became lax again, then disappeared, and the wrinkled face grinned up at me. He chuckled and held something up for Conway to see.

"This!" he announced.

I stared into his hand and saw what appeared to be a slim, metal cylinder, about three inches long and about half an inch thick. He twisted the end of it, and slowly the machine settled down onto the grass. Giving a knowing wink in the direction of the thing he climbed into the driving seat and beckoned.

"Hop aboard, boys, and I'll give you a ride."

Without second bidding, Conway jumped up and then bent down and grasped my collar. In a few seconds I was on the machine's top, having been dragged up like a sack of potatoes. I watched the old man squeeze a button and the engine purred into life, gave a slight jolt, and set off through the dripping trees.

Conway wriggled closer to the old man and gazed earnestly into the wrinkled face.

"Where do you come from?" he asked.

Methuselah chuckled shrilly and shook his head.

"Don't ask questions," he laughed, "and maybe you'll get no lies."

This stumped Conway and he sat in silence. I huddled balefully on the uncomfortable metal, trying to keep dry, thinking the whole affair fantastic and far beyond my ken. Who this old guy was, or where he came from, didn't interest me in the slightest. I just wanted to find a dry spot where I could light a cigarette and rest.

After a short time the tractor came out into another small clearing, but this one was littered with boxes and gadgets and all sorts of equipment strewn over the ground. We came to a stop in a clear patch and the old man dismounted and ran nimbly to a bush, where he dragged forth a large, open crate. Or was it open? I looked closer, and it appeared to be open one second, and closed the next,

the surface of the space inside simmering and shining like a crystal caught in a sunbeam. Around the outside of the crate were several coils, whilst a large antenna stuck out of the top.

Without paying attention to us the old man commenced to toss the scattered equipment into the box. The equipment glowed slightly as it lay poised over the top and then disappeared into the interior. By the time that the last part had dropped into the box I calculated that the overall cubic dimensions of all the pieces tossed in exceeded the total volume of the box by about thirty times.

There followed the greatest surprise of all, for the old timer now got out the little cylinder, pointed it at the tractor, and twisted the end. The machine slowly raised itself off the ground and swung about in the air until it was directly over the mouth of the box. Gently it lowered until it touched the box, where it began to dissolve like a cube of sugar on water, until not an atom of it was left in sight. Methuselah then turned to us and grinned.

"Neat, eh?" he said. "I guess you boys are too primitive to understand.

Conway nodded and shrugged helplessly.

"Where's it all gone?" I asked weakly.

"You mean *when's* it all gone," the old man said with a laugh.

Conway nodded again, and then began to twitch, and I knew he was thinking hard.

"I'll do you two a favour," Methuselah went on. "I'd like some money samples of your time. You give me some and I'll give you this."

He held up the anti-gravity tube, and I saw Conway's mouth water. He reached out and took the instrument before the old man could change his mind, then turned to me.

"O.K., Bliester," he said. "You heard what the man said. Give him some money."

I protested feebly, but handed over all my spare credits, whilst Conway gloated over the cylinder.

"Now," the man said. "Watch the box for me while I go and fetch my other things."

With that, he disappeared into the brush. When he was out of hearing, Conway grabbed my arm.

"Bliester," he grinned, "our troubles are over. I've got a fortune here. Anti-gravity!"

"But who is this old guy?" I asked. "I don't get it!"

"You're just dumb," he snapped. "Have I got to explain everything to you?"

Perhaps it was because we were so engrossed in the little fortune-maker that we didn't hear them approach, but suddenly, we were man-handled, trussed securely, and lay staring up into the grinning faces of Holtz and Schiemer; the latter moron gloating over the metal cylinder he held so reverently in his shaking hand!

"Sorry, my dear friends," Holtz laughed, "to break up such a perfect afternoon. When a certain little lady known to Mr. Bliester told us you were coming out here, we had to follow you and check up. What a find, eh?"

"You—" Conway struggled, but Holtz cut him short with a penalty kick.

"Nice old man you discovered," he grinned, "and what a bargain."

"Look," Conway pleaded. "That guy is the greatest find in history, Holtz. Why can't we come to some arrangement?"

Schiemer chuckled evilly.

"Arrangements with you," he said slowly, "always mean the worse for us. Not this time, Conway. O.K., Holtz, in with them."

Schiemer strode over to the strange box and turned a large dial on the side as far round as it would go. "This should get rid of you," he grinned.

Quickly they picked up Conway's struggling body, and with complete disregard for his scientific attainments, dumped him into the box. I watched fascinated as he dissolved as quickly as whisky in gin. In a moment I found myself suspended over the shifting surface of the interior, and then found myself falling into what seemed to be a bottomless pit. Suddenly I felt a great jar, and landed on

the grass in the same clearing I had just unceremoniously left.

I gazed about me. The place was empty except for Conway, who was struggling violently against his bonds and calling me names that would have sent my father crazy. He caught sight of me, and landed a hefty kick on my rear.

"You idiot!" he bawled. "Those two bums have got that anti-gravity device with the aid of your big trap! Wait till I get my hands on that bitch of yours . . ."

I managed to free myself and then untied Conway. He steamed.

"I didn't know she was a spy," I cried.

"Oh, come on," he said hotly. "Unless I'm mistaken, we're finished."

He dashed off through the now summer dry undergrowth, and I chased after him, wondering why the sudden change in season, and cursing his speed. We made it back to the digs in what must have been record time, and I stood dead beat as Conway rushed inside and called the landlady. She came out and eyed us warily.

"Look," Conway panted, "how long have we been gone?"

"I know you," she said slowly. "You owe me seven months' rent!"

"Seven months!" Conway shouted. "Oh, no!"

He turned and regarded me with lava in his glance.

"We're lucky, Bliester," he said. "We're lucky. Holtz must have turned that dial round in the wrong direction. You dumb cluck, it was a time machine, that's where that old man came from. We're lucky we didn't end up in doomsday! And to think that those two skunks not only pinched our anti-gravity machine—but stole seven months of our lives. Oh, Bliester, I'll crack your skull—I'll—oh, what's the use!"

I shrugged, still at a loss. However, I see it all now, for Conway has battered it into my brain. That's why the Handbook reads: 'Anti-gravity: First discovered by Holtz and Schiemer, 2044,' which is eyewash, because it should read . . . But then, nobody believes us!

MINIATURE MICROSCOPY

by

WALTER G. SPEIRS

WANT TO LOOK AT AN ATOM? THIS ARTICLE EXPLAINS
THE LATEST TOOLS USED FOR THAT PURPOSE—
TOGETHER WITH SOME OF THEIR SNAGS

PROBING PAST FRONTIERS THAT APPEAR FIRMLY CLOSED has always been a strong human habit—the frontiers of the sky, the sea, of high mountains and the poles, and now of space. And yet, perhaps, the most fascinating of all frontiers is found in the realm of the microscopically small. Ordinary microscopy was not enough. “Down” there, far beyond the wavelength of light, lay the secrets of the building blocks of the stars, the origins of matter, the secret of life itself. Somehow, a means had to be found of “seeing” objects too small to be seen by ordinary light.

The resolving power of ordinary microscopes is limited by the wavelength of light to about 2,000 Angstroms. Resolving power, or resolution, is the ability to distinguish between objects close together and 1 A. is a ten millionth of a millimetre, about the distance between combined atoms. A slight improvement is obtained by using the shorter wavelengths of ultraviolet light: but the structure of viruses, plant cells and metals can only be seen by using much smaller wavelengths, such as are associated with moving electrons. This is only about a 25 thousandth of the wavelength of light.

The electron microscope is now no longer just a research tool; there are over a thousand in use all over the world—at

least 50 in this country—and they are being manufactured in most of the technically developed nations.

Although the theory was worked out by 1926, the first electron microscope was built in Germany in 1934. By 1936 the British were building them, but the Americans didn't get around to it until 1939.

There are two basic trends now apparent in the design of these microscopes. The use of cheap, permanent magnets as focusing devices has led to low-priced models suitable for industrial laboratories. The snag is that magnification is low, 1,500, 3,000 and 6,000, and magnetic lenses must be changed to alter the magnification. Even so, they cost about £10,000.

But, for research instruments, the sky is the limit. Custom-built models use electromagnetic and electrostatic lenses to give continuously variable magnification, up to a magnification of 160,000—and can pick out objects only 15 A. apart. All sorts of additional gadgetry extends the usefulness of these research models.

Surprisingly enough, an electron microscope is an ingenious but simple device. Most of it is just emptiness, an evacuated tube through which electrons are squirted and focused by electromagnetic fields. At the far end a fluorescent screen is lit by the electrons and part of their energy gives a television-like picture.

The electrons come from a hot wire; the filament out of a sixpenny electric light bulb will do. Pulled off the wire by a high voltage, they are accelerated towards a small hole in a metal plate. Those that get through are grabbed by the electromagnetic lenses and concentrated on the sample being examined.

The accelerating voltage is usually about 100,000 volts, but 1,000,000 volts are, or soon will be, used to really speed up the electrons. Then they will be able to penetrate thicker specimens. Care must be taken to keep the voltage constant to within one part in 10,000 or the image is blurred.

All this has to be carried out in a really good vacuum—in practice a mechanical pump is used to get the pressure down and then an oil diffusion pump sweeps the remainder of the air out. Without a good vacuum the electrons merely collide with gas molecules and are slowed down.

The lenses used to focus the electron beam are simple in construction but devilish in their theory. Using electromagnetic fields, they bend the electron beam over a considerable distance instead of at a sharp surface, as with light through glass lenses. Magnetic fields are the most widely used but electrostatic fields are utilised for particular jobs.

The magnetic lenses are doughnuts of wire through which an electric current flows, the effect depending on the strength and size of the magnetic field and the speed of the electrons.

Electrostatic lenses use high voltages to force the electrons into the required paths but they are more delicate to use, their efficiency depending on just how good a vacuum is obtained. A slight leak and miniature lightning strokes occur inside the microscope. Too, they are more expensive.

So most electron microscopes contain magnetic lenses, although scattering of electrons does tend to limit the amount of detail that can be seen. However, the magnification can be altered so the operator can easily have an overall look at a specimen and pick out a particular section for closer examination.

Other electron microscopes have been built in which electrons are pulled off the surface of the specimen, magnified and smacked onto a screen to give a picture. Another type uses an intense beam of electrons, as in a television tube, to scan the specimen whilst a third method mounts the sample at an angle so that electrons are reflected from its surface to give a shadow-picture of the projections on its face.

Now comes the main problem, the preparation and handling of specimens. As the tools of science become more and

more high-powered, so their requirements have become more specific. You can use an ordinary light microscope to examine a piece of rock, a drop of bacterial culture, a sample of blood or the body of an insect. But an electron microscope only works with a high vacuum, and electrons can only penetrate ultra-thin specimens. Too, the electrons that are absorbed heat the specimen up by about 100 Centigrade degrees.

Which means they must not only be completely dry, but must be cut thinner than was once thought possible.

Preparation of the sample ready for mounting is complex and is really a new branch of microscopy. If you're fumble-fingered stay away from this type of job—its enough to make strong men weep when their twentieth attempt is ruined by too heavy breathing. Tissues and fibres have to be cut into the thin slices but, as they are not rigid, they are first embedded in a solid. The standard method used in ordinary microscopy is to set them in wax or to freeze them solid and then go at them with a microtome, a gadget rather like a bacon slicer. But samples for electron microscope work must be less than 2,000 A. thick for organic matter and 1,000 A. for metals, the electron penetration depending on the density.

The material is first embedded in a hard plastic and a knife cuts slowly through it. Using knives made of glass, sections only 200 A. thick can be cut.

The specimens are usually placed on a metal grid about a fifth of an inch in diameter, containing 200 meshes to the inch. In the photographs of the image, these look more like giant windows than fine meshes. Although smoke particles can be collected directly onto the grid, most specimens must first be mounted on a thin film of plastic about 100 A. thick. This film can only be formed by dropping a solution of the plastic onto water and allowing the solvent to evaporate before the film is picked up onto the grid.

On this film the specimens are positioned—fine particles

can just be sprinkled on, and micro-organisms, bacteria and viruses may be sprayed on from a spraygun.

Then they are well dried and placed in an air-lock on the side of the microscope. The mounting is put in place by remote control; it has to be movable as only a small part of the specimen—an area about 20,000 Å across—can be seen at one time and it has to be manipulated to bring different parts into the field of vision.

One widely used trick to obtain clear pictures of the surface of thick samples is to make a replica of the surface. Like photographic negatives, these replicas faithfully reproduce the surface structure but are transparent to electrons—thin sheets of plastic are formed on the face and stripped off. In another method, replicas of metal surfaces are made by pressing them into thin sheets of aluminium or by oxidising the surface and dissolving the mass of metal away—leaving the film of metal oxide as a thin sheet.

A replica of a replica can be made and pipe detail shown up by shadow-casting. Metal is evaporated onto the film almost parallel to its surface so projections receive a heavy deposit on one side and throw clear shadows across the rest of it.

In optical microscopy, details of sections are brought out by using dyes capable of staining different types of tissue—but electron microscopy depends on the mass of atoms, not their light transmitting properties, so colour-staining is useless. Instead, sections are stained using solutions of the heavier elements such as osmium and tungsten, impenetrable to electrons.

The electron beam, unfortunately, affects the specimens; on an average one electron collides with each atom in the field of vision every second. It's like trying to get a picture of a piano by spraying it with machine gun bullets and analysing the patterns made by the bullets on the far wall. It does not seem likely that it will be possible to examine large, living organisms in the electron microscope.

Ninety-two per cent. of bacilli were killed by the beam and the vacuum in one test, but spores and viruses can be examined. If living matter cannot be put in the vacuum without being dehydrated, then it will have to be put in an airtight cell. But this means that at least a million volts must be used to force the electrons through the container—with a consequent increase in the amount of damage done.

When specimens are dried before placing in the vacuum there is an inevitable change in their shape; bacteria are stretched and their tails badly distorted.

To prevent this, it is possible to take the water out of them by a series of changes instead of a true drying process. The water is replaced by acetone, a light solvent, by soaking the sample in it and this replaced by amyl acetate, the solvent smelling of pear-drops. In turn, this is replaced by liquid carbon dioxide under pressure. The temperature is raised to over 31 degrees Centigrade, still under pressure, when the carbon dioxide can no longer exist as a liquid, changing to a compressed gas.

The pressure is slowly released and the gas allowed to escape by diffusion—ending up with an undistorted, water-free specimen.

At the viewing end, the normally invisible electron beam which has been scattered by collision within the specimen hits a viewing screen. This is just a glass plate coated with a fluorescent powder to convert 10% of the energy of the electrons into light. The contrast given by these screens is less than that of a photographic plate, but physicists are usually in a hurry—it takes ten minutes to pump the water and gases out of a photographic emulsion. The usual technique is to photograph the picture on the screen and enlarge this.

As with some television tubes, the electrons hitting the screen produce dangerous X-rays and the operator must be protected by a sheet of heavy lead glass over the screen.

It is possible to keep the amount of distortion in the picture to below 5%, but each instrument must be calibrated against standard measures whose size is accurately known. Large molecules, skeletons of tiny diatoms and diffraction gratings, are used for this check.

Under special conditions, physicists have been able to resolve objects only 2 Å. apart, but they hope to bring the resolving power down to 1Å. Already composite photographs of atoms have been obtained. Admittedly, they are built up from several different shots and, of necessity, must be of atoms in crystals. These atoms are held in place and, at low temperatures, are almost stationary. The atoms in liquids and gases, however, must await improved methods—photographing these is like trying to see a bullet vibrating backwards and forwards at thousands of miles a second.

The X-ray microscope, whilst incapable of giving as great a magnification as the electron microscope, is giving valuable information on the internal structure of samples too thick and dense to be penetrated by electrons.

Although it is impossible to make lenses to focus X-rays, recently it has been found possible to use special, cylindrical mirrors to reflect them. Thus another valuable tool has been added to the microscopists' laboratory. It has a theoretical resolving power of 70 Å., but present-day instruments are nowhere near that standard yet.

Now that the atoms themselves can be seen, physicists will undoubtedly try to see into the interior of the atom, where mesons, neutrons and protons are the building blocks. Radically new methods, at which we cannot as yet even guess, will be needed, but one day, whether soon or in the far future, these will be developed.



NO CHARGE FOR ALTERATIONS

by H. L. GOLD

*IT WOULD BE SO MUCH EASIER IF WE COULD ALTER THE MAN
TO FIT THE PLANET INSTEAD OF THE PLANET TO FIT THE MAN*

IF THERE WAS ONE THING DR. KALMAR HATED, AND THERE were many, it was having a new assistant fresh from a medical school on earth. They always wanted to change things. They never realised that a planet develops its own techniques to meet its own requirements, which are seldom similar to those of any other world. Dr. Kalmar never got along with his assistants and he didn't expect to get along with this young Dr. Hoyt who was coming in on the transfer ship from Vega.

Dr. Kalmar had been trained on Earth himself, of course, but he wistfully remembered how he had revered Dr. Lowell when he had been Lowell's assistant. He'd known that his own green learning was no match for Dr. Lowell's wisdom and experience after thirty years on Deneb, and he had avidly accepted his lessons.

Why, he grumbled to himself on his way to the spaceport to meet the unknown whippersnapper, why didn't Earth turn out young doctors the way it used to? They ought to have the arrogance knocked out of them before they left medical school. That's what must have happened to him, because his attitude had certainly been humble when he landed.

The spaceport was jammed, naturally. Ship arrivals were infrequent enough to bring everybody from all over the planet who was not on duty at the farms, mines, factories, freight and passenger jets and all the rest of the busy activities of this comparatively new colony. They brought their lunches and families and stood around to watch. Dr. Kalmar went to the platform.

The ship sat down on a mushroom of fire that swiftly became a flaming pancake and then was squashed out of existence.

"I'm waiting for a shipment of livestock," enthused the man standing next to Dr. Kalmar.

"You're lucky," the doctor said. "They can't talk back."

The man looked at him sympathetically. "Meeting a female?"

"Gabbier and more annoying," said Dr. Kalmar, but he didn't elaborate and the man, with the courtesy of the frontier, did not pry for an explanation.

Livestock and freight came down on one elevator and passengers came down another. Sidewalks carried the cargo to Sterilisation and travellers to the greeting platform. Dr. Kalmar felt his shoulders droop. The man with the medical bag had to be Dr. Hoyt and he was even more brisk, erect and muscular than Dr. Kalmar had expected, with a superior and inquisitive look that made the last assistant, unbearable as he'd been, seem as tractable as one of the arriving cows.

Dr. Hoyt spotted him instantly and came striding over to grab his hand in a grip like an ore-crusher. "You're Dr. Kalmar. Glad to know you. I'm sure we'll get along fine together. Miserable trip. Had to change ships four times to get here. Hope the food's better than shipboard slop. Got a nice hospital to work in? Do I live in or out?"

Dr. Kalmar was grudgingly forced to say rapidly, "Right. Likewise. I hope so. Too bad. Suits us. I think so. In."

He got Dr. Hoyt into a jetcab and told the driver to make time back to the hospital. Appointments were piling up while he had to make the courtesy trip out to the spaceport, which was another nuisance. Now he'd have all of those and a talkative assistant who'd want to know the reasons for everything.

"Pretty barren," said Dr. Hoyt, looking out of the window at the vegetationless ground below. "Why's that?"

He'd known he was going to Deneb, Dr. Kalmar thought angrily. The least he could have done was read up on the place. *He* had.

"It's an Earth-type planet," Dr. Kalmar said in a blunt

voice, "except that life never developed on it. We had to bring everything—benign germ cultures, seed, animals, fish, insects—a whole ecology. Our farms are close to the cities. Too wasteful of freight to move them out very far. Another few centuries and we'll have a *real* population, millions of people instead of the 20,000 we have now in a couple of dozen settlements around this world. Then we'll have the whole place a nice shade of green."

"City boy myself," said Dr. Hoyt. "Hate the country. Hydroponics and synthetic meat—that's the answer."

"For Earth. It'll be a long time before we get that crowded here on Deneb."

"Deneb," the young doctor repeated, dissatisfied. "That's the name of the star. You mean to tell me the planet has the same name?"

"Most solar systems have only one Earth-type planet. It saves a lot of trouble to just call that planet Deneb, Vega or whatever."

"Is *that* clutch of shacks the *city*?" exclaimed Dr. Hoyt.

"Denebia," said Dr. Kalmar, beginning to enjoy himself finally.

"Why, you could lose it in a suburb of Bosyorkdelphia!"

"That monstrosity that used to be New York, Pennsylvania, Connecticut, Rhode Island and Massachusetts? I wouldn't want to."

He was pleased when Dr. Hoyt sank into stunned silence. If luck was with him, that stupefaction might last the whole day. It seemed as though it might, for the sight of the modest little hospital was too much for the youngster who had just come from the mammoth health factories of Earth.

Dr. Hoyt revived somewhat when he saw the patients waiting in the scantily furnished outer room, but Dr. Kalmar said: "Better get yourself settled," and opened a door for his immature colleague.

"But there's only one bed in this room," Dr. Hoyt objected. "You must have made a mistake."

Dr. Kalmar, recalling the crowded cubicles of Earth, gave out a proud little dry laugh. "You're on Deneb now, boy. Here you'll have to get used to spaciousness. We like elbow room."

The young doctor went in hesitantly, leaving the door open for a fast escape in case an error had been made. Dr. Kalmar had done the same when he'd arrived nine years ago. Judging by his own experience, it would take Dr. Hoyt a full six months to get used to having a room all to himself. There would be plenty of time to start showing him the ropes tomorrow, and in the meantime there were the backed-up appointments to be taken care of.

Dr. Kalmar went to his office and had his nurse, Miss Dupont, send in the first patient.

It was a girl of seventeen, Avis Emery, who had been brought by her parents. She sat sullenly, dark-haired, too daintily pretty and delicately shapely for a frontier world like this, while Mr. Emery put the file from Social Control on the doctor's desk.

"We're farmers—" the man began.

Dr. Kalmar interrupted, "The information is in the summary. Avis is to be assigned her mate next year, but she wants to go to Earth and become a nightclub singer. She refuses to marry a boy who'd be able to help around the farm, and she won't work on it herself."

He looked up severely at the parents. "This is your own fault, you know. You pampered her. Farm labour is too valuable for pampering. We can't afford it."

"You can blame me, Doc," said Mr. Emery miserably. "She's such a pretty little thing—I couldn't work her the way Sue and I work ourselves."

"And then she started getting notions," Mrs. Emery added, giving her husband a vicious glare. Dr. Kalmar could imagine the nights of argument and accusation before they were at last forced to go for medical help to solve their self-created problem. "Singing in nightclubs back on Earth, marrying a billionaire, living in a sky yacht!"

"Avis," said Dr. Kalmar gently. "You know it's not that easy, don't you? There are lots and lots of pretty girls on Earth and very few billionaires. If you did get a job singing in a nightclub, you know you'd have to do some unpleasant things because there's so much competition for customers. Things like strip-teasing, drinking at the tables and going out with whoever the owner tells you to."

The girl's face grew animated for the first time. "Well, sure! Why do you think I want to go?"

"And you don't love Deneb and your farm?"

"I hate both of them!"

"But you realise that we must have food. Doesn't it make you feel important to grow more food so we can increase our population?"

"No! Why should I care? I want to go to Earth!"

Dr. Kalmar shook his head regretfully. He pushed a button on his desk. It was connected to a gravity generator directly under the girl's chair. Four gravities suddenly pushed her down into it and a hypodermic needle jabbed her swiftly with a hypnotic drug. She slumped. He released the button and the artificial gravity abated, but she remained dazed and relaxed.

"You're not going to hurt her, are you, Doc?" Mr. Emery begged.

"Certainly not. But I suppose you know Social Control's orders."

They nodded, the husband gloomily, the wife with a single sharp jerk of her head.

"You go right ahead and do it," she said. "I'm sick of working my fingers to the bone while she primps and preens and talks all the time about going to Earth."

"Come, Avis," Dr. Kalmar said in a low, commanding voice.

She stood up, blank-faced, and followed him out to the Ego Alter room. He closed the door, sat her down in the insulated seat next to the control console, put the wired plastic helmet on her and adjusted it to fit her skull snugly.

Running his finger down the treatment sheet of her Social Control file, he set the dials according to its instructions. The psychic areas to be reduced were sex drive, competitiveness and imagination, while the areas of reproductive urge and co-operation were to be intensified. He regulated the individual timers and sent the varying charge through her brain.

There was no reaction, no convulsion, no distortion of features. She sat there as if nothing had happened, but

her personality had changed as completely as though she had been re-trained from birth.

Miss Dupont came in without knocking. She knew, of course, that any patient in the Ego Alter room would be incapable of being disturbed.

"Rephysical, Dr. Kalmar?" she asked.

"I'm afraid so. Will you prepare her, please?"

The nurse removed the girl's clothes. There was no resistance.

"Such a lovely body," she said. "It's a shame."

He shrugged. "Until we have enough people and farms and industries, Miss Dupont, we'll just have to get used to altering people to fit the needs of our society. I'm sure you understand that."

"Yes, but it still seems a shame. Bodies like that don't grow on trees."

He gently moved the girl into the Rephysical Chamber. "They grow in this machine, though. As soon as we can afford it, which ought to be only a few hundred years from now, we can make any woman look like this, or even better."

"And don't forget the men," Miss Dupont said as he started the mitogenetic generator. "We could use some Adonises around here."

"We'll have them," he assured her.

"Somebody will. None of us'll live that long."

Working like a sculptor with a cathode in one hand and an anode in the other, Dr. Kalmar began reshaping the girl who stood fixedly in the boxlike chamber. The flesh fled from the cathode and chased after the anode as he broadened the fine nose, thickened the mobile lips, squared the slender jaw and drew out carefully the delicately arched orbital ridges.

"I'll leave the curl in her hair," he said. "Every woman needs at least one feature she can be proud of."

"You're telling me," Miss Dupont replied.

"Synthetic tissue, please."

She drew out a tube with a variable nozzle and started working just ahead of him. A spray of high-velocity cells shot through the girl's smooth skin at the neck, shoulders,

breasts, hips and legs, forming shapeless lumps that he guided into cords and muscles. The slim figure quickly broadened, grew brawny and competent-looking, the body of a woman who could breed phenomenally while farming alongside her man.

Dr. Kalmar racked up the instruments and helped Miss Dupont dress the girl in coveralls and sandals. He felt the pride of craftsmanship when he found that the clothing supplied for her by Social Control exactly fitted her. He injected an antidote to the hypnotic and gave her the standard test for emotional response as her expressionless face cleared to placidity.

"Do you know where you are, Avis?"

"Yes. Ego Alter and Rephysical."

"What have we done to you?"

"Changed me to fit my environment."

"Do you resent being changed?"

"No." She paused and looked worried. "Who's taking care of the crops while I'm here?"

"They can wait till you and your parents get back, Avis. Let's show them the change, shall we?"

"All right," she said. "I think they'll be proud of me. This is how they always wanted me to be."

"And you?"

"Oh, I feel much better. As if I don't have to try so hard."

"I'm glad, Avis. Miss Dupont, better have a sedative ready when her father sees her. I think he'll need it."

"And her mother?" asked the nurse practically.

"She'll probably want a drink to celebrate. Give her one."

Dr. Kalmar's prognosis was correct, only it didn't go far enough. His young assistant from Earth had come scooting out of his disquietingly large quarters and was jittering in the office whey they entered.

"Is *that* the pretty girl who was waiting when we came in?" he yelped in outrage. "What have you done to her?"

Dr. Kalmar gave the sedative to him instead of Mr. Emery, who was shocked, but had known in advance what

to expect. Miss Dupont prepared another sedative quickly, gave Mrs. Emery a celebration drink and moved the family toward the door.

"She looks fine, Doctor," the mother said happily. "Avis ought to be a big help around the house and farm from now on."

"I'm sure she will," he said.

"But she was so lovely!" wept Mr. Emery, though in a rapidly becalming voice as the sedative took effect.

The door closed behind them.

"You ought to be reported to the Medical Association back on Earth!" Dr. Hoyt said angrily. "Ruining a girl's looks like that!"

Dr. Kalmar sighed. He had hoped to be able to put off this orientation lecture until the following day, when there wouldn't be so many patients jamming his appointments book.

"All right, let's got it over with. First, I was also trained on Earth and know how Ego Alter and Rephysical are used there: Ego Alter to remove psychic blocks so people can compete better, and Rephysical so they'll be more attractive. Second, we're not under the jurisdiction of Earth's Medical Association. Third, we'd damn well better not be, because our problems and solutions aren't the same at all."

"You'd have been jailed for spoiling that girl's chances of a good marriage!"

"I didn't," Dr. Kalmar said quietly. "I improved them."

"You did nothing of the——" Dr. Hoyt stopped. "Improved? How?"

"I keep telling you this is a frontier world and you keep acting as if you understand, but you don't. Look, a family is an economic liability on Earth; it consumes without producing. That's why girls have so much trouble finding husbands there. Out here it's different. A family is an asset—if every member in it is willing to work."

"But a pretty girl like that can always get by."

"No Denebian can afford to marry a pretty girl. It's too risky. She can't work as hard as we do and still take care of her looks. And he'd worry about her constantly, which would cut into his efficiency. By having me make her a

merely attractive girl in a wholesome, hearty way, Social Control guarantees more than just a marriage for her—it guarantees a contented married life.”

“Sweating away on a farm,” Dr. Hoyt said.

“Now that her anti-social strivings are gone, she’ll realise that Deneb needs farmers instead of nightclub singers. She’ll take pride in being a good worker, she’ll raise as many children as she’ll be capable of bearing, and she’ll have a good husband and prosperous farm. That wouldn’t have satisfied her before. It will now. And she’s better for it and so is Deneb.”

Dr. Hoyt shook his head. “It’s all upside down.”

“You’ll get used to it. Why not take to-day off and explore Denebia? You need a rest after all those months in space.”

“Maybe I will,” said Dr. Hoyt vaguely, slightly anaesthetised.

“Good.” Dr. Kalmar buzzed for Miss Dupont. “Send in the next patient, please. Oh, and Dr. Hoyt is taking the day off.”

But the young assistant was stunned into staying by the huge size of the Social Control file that was carried by the next patient, Mr. Fallon and his wife.

“I know just what you’re thinking, Dr. Kalmar!” cried Mrs. Fallon distractedly, but with a nervously bright smile. “Those awful Fallons again! I don’t blame you a bit, but——”

As a matter of fact, that was exactly what Dr. Kalmar was thinking, plus the defeated feeling that they were all he needed to make the day complete.

“Good Lord, what’s in all those files?” Dr. Hoyt exclaimed.

Dr. Kalmar could have explained, but he didn’t feel up to it.

Mr. Fallon, a wispy, shyly affable, poetic-looking chap, did it for him. “Papers,” he said.

“I know that, but why so many?” Dr. Hoyt asked impatiently.

Miss Dupont seemed wryly amused as she watched his consternation.

"I guess you might say it's because I can't make my mind up," confessed Mrs. Fallon with an uneasy giggle. She was a big woman who might have gurgled over a collection of toy dogs on Earth, but here she was a freight checker and her husband was a statistician in the Department of Supply, though on Earth he might have been anything from a composer to a social worker. "No matter how often we rephysical Harry, I always get tired of his looks in a few months."

"And how often has that been done?" Dr. Hoyt demanded.

"I think it's eleven times. Isn't that right, dear?"

"No, sweet," said Mr. Fallon. "Thirteen."

Dr. Kalmar could have interrupted, but he considered it wiser to let his assistant learn the hard way. Miss Dupont was enjoying it too much to interfere.

"We've made him tall and we've made him short, skinny, fat, bulging with muscle, red hair, black hair, blond hair, grey hair—I don't know, just about everything in the book," said Mrs. Fallon, "and I simply can't seem to find one I'd like for keeps."

"Then why the devil don't you get another husband?"

Mrs. Fallon looked shocked. "Why, he was assigned to me!"

"Dr. Hoyt just came from Earth," Dr. Kalmar cut in at last, before a brawl could start. "He's not familiar with our methods."

"Let's hear the cockeyed reason," Dr. Hoyt said resignedly.

"We keep our population balanced," said Dr. Kalmar. "Too many of either sex creates tension, hostility, loss of efficiency; look at Earth if you want proof. We can't risk even a little of that, so we use prenatal sex control to keep them nearly equal."

"There's a wife for every man," Mr. Fallon put in genially, "and a husband for every woman. Works out fine."

"With no surplus," Dr. Kalmar added. "There are no floaters to allow the kind of marital moving day you have on Earth, where so many just up and shift over to new

mates. We get ours for life. That's where Ego Alter and Rephysical come in."

"You mean people bring in their mates to have them done over?"

"If they're not satisfied and if the mates agree to be changed."

"I don't mind," said Mr. Fallon virtuously. "I figure Mabel will decide what she wants one of these changes, and then we can settle down and be happy with each other."

"But what about you?" asked Dr. Hoyt, bewildered. "Don't you want her changed?"

"Oh, no. I like her fine just as she is."

"You see now how it works?" Dr. Kalmar asked. "We can't have a variety of mates, but we can have all the variety we want in one mate. It comes to the same thing, as far as I can see, and causes much less confusion, especially since we need stable relationships."

Dr. Hoyt was striving heroically to stay indignant in spite of the sedative. "And do many ask to have their mates changed?"

"I guess we're a sort of record, aren't we?" Mr. Fallon boasted.

"I guess you are," agreed Dr. Kalmar. "And now, Dr. Hoyt, if there aren't any more questions, I'd like to proceed with this couple."

Dr. Hoyt stretched his eyes wide to keep them open. "It's all screwy to me, but it's none of my business. As soon as I finish my internship, I'm heading back to Earth, where things make sense, so I don't have to understand this mishmash you call a planet. Need help?"

"If you'd find out what Mrs. Fallon has in mind this time, it would let me run the patients through a lot faster."

"How would they feel about it?" Dr. Hoyt asked.

"It's all right with me," Mr. Fallon said amiably. "I'm pretty used to this, you know."

"But what are we going to make you look like, Harry?" his wife fretted. "I felt very jealous of other women when you were handsome and I didn't like you just ordinary-looking."

"Why not go through the model book with Dr. Hoyt?"

suggested Dr. Kalmar. "There are still some types you haven't tried."

"There *are*?" she asked in gratified astonishment. "Would you mind very much, Dr. Hoyt?"

"Glad to," he said.

Miss Dupont brought out the model book for him, and he and Mrs. Fallon studied the facial and physical types that were very explicitly illustrated there in three-dimensional full colour. Mr. Fallon, contentedly working out math. problems on a sheet of paper, left the choice entirely to her.

Meanwhile, Dr. Kalmar and Miss Dupont swiftly took care of a succession of other patients, raising the tolerance level of frustration in a watchmaker, replating the acne-pitted skin of a sensitive youth, restoring a finger lost in a machine-shop accident, and building up good-natured aggression in an ore miner whose productivity had slumped.

Mrs. Fallon still hadn't decided when the last patient had been taken care of. She said unhappily, "I don't know, I simply absolutely don't know. Couldn't you suggest *something*, Dr. Hoyt?"

"Wouldn't be ethical," he said bluntly. "Not allowed to."

Dr. Kalmar, checking the Social Control papers with Miss Dupont, wondered if he should interfere. It would lower confidence in Dr. Hoyt, which meant that people would insist on Dr. Kalmar's treating them. Then, instead of having an assistant to remove some of the load, he'd have to do the work of two men. He decided to let the young doctor handle it.

But Dr. Hoyt stood up in exasperation, slammed the book shut, and said, "Mrs. Fallon, if you know what you want, I'll be glad to oblige. But I'm not a telepath——"

"Is there anything I can do?" Dr. Kalmar interrupted quickly, before his assistant could create any more damage.

"He doesn't have to get huffy," Mrs. Fallon said indignantly. "All I asked for was a suggestion or two."

"Insult my wife, will he?" Mr. Fallon belligerently added.

"It's my fault," Dr. Kalmar said. "Dr. Hoyt just got in to-day from Earth and he's tired and he naturally doesn't understand all our ways yet——"

"Yet?" Dr. Hoyt repeated in disgust. "What makes you think I'll ever——"

"And I shouldn't have burdened him with this problem until he's had a chance to rest up and look around," Dr. Kalmar continued in a slightly louder voice. "Now, let's see if we can't settle this problem before closing time, eh?"

The Fallons subsided. Dr. Hoyt watched with a sarcastic eye, though he kept silent as Dr. Kalmar and Miss Dupont, working as a shrewd team, gave them the suggestion they had been looking for. It was all done very smoothly, so smoothly that Dr. Kalmar felt professional pride because even his stiff-necked assistant was unable to detect the fact that it *was* a suggestion.

Dr. Kalmar got Mrs. Fallon to reminisce about the alterations her husband had undergone, and Miss Dupont promptly agreed with her when she explained why each had been unsatisfactory. It took some time, but he eventually brought her back to what Mr. Fallon had looked like when she's first married him.

"Now, isn't that the strangest thing?" she said, puzzled. "I can't remember. Can you, dear?"

"It's a little mixed up," Mr. Fallon admitted. "Let's see, I know I was taller and I think I had a long, thin face——"

"Oh, we don't have to guess," Dr. Kalmar said. "Nurse, we have the information on file, don't we?"

"Yes, Doctor," she said, and instantly produced a photograph. They evidently thought it was merely filing efficiency; they hadn't noticed her searching for the picture quietly while Dr. Kalmar had been leading them on. He had, in fact, delayed asking her until she'd nodded to indicate that she had found it.

Mr. Fallon frowned as if he'd recognised the face but couldn't remember the name. His wife gave a little shriek of admiration.

"Why, Harry, you looked perfectly wonderful!"

"Those deep dimples made shaving pretty hard," he recalled.

"But they're *darling*! Why did you ever let me change you?"

"Because I wanted you to be happy, sweet."

It was as simple as that—a bit of practical psychology based on knowledge of the patients. Dr. Kalmar wished wistfully that old Dr. Lowell had been there to observe. He would have approved, which might have made up for Dr. Hoyt's unpleasant expression.

"I hope this is the one you want," Dr. Kalmar said as he took them to the front door after the rephysical.

"Goodness, I hope so!" Mrs. Fallon exclaimed. She looked fondly at her husband, and this time had to look up to see his face. "I'm almost *positive* this is what I want Harry to be."

"Well, if it isn't, sweet," Mr. Fallon said, "we'll try something else. I don't mind as long as it makes you happy."

They closed the door behind them, leaving the hospital empty of all but the small staff.

"They're crazy!" Dr. Hoyt exploded. "He's not the one we should be changing. That idiotic female needs a good Ego Alter!"

"He hasn't asked for it," Dr. Kalmar pointed out patiently.

"Then he ought to!"

"That's his decision, isn't it? There's such a thing as ethics, you know."

"I've never seen anything more insane than the way you work," snapped Dr. Hoyt. "I can't wait to finish my stretch here and go home."

He stamped out, weaving slightly because of the sedative.

"Well, what do you think of our assistant?" asked Dr. Kalmar.

"He's cute," Miss Dupont said irrelevantly.

Dr. Kalmar glowered at her. He'd forgotten that she was due to have a mate assigned to her this year.

Routine at the hospital was anything but routine. Dr. Hoyt barely kept from yelping each time someone was treated, and his help was given so unwillingly that Dr. Kalmar, sweating under a double load and with Dr. Hoyt to argue with at the same time, was all for putting him on

the ship and asking Earth for another interne. But Miss Dupont talked him out of it.

For no discernible reason other than loneliness, Dr. Hoyt was taking her out. She was pleased, even though he crabbed constantly about the shabby-looking clothes she wore, which were typical of Deneb, and the way they fitted her.

Either the two of them didn't talk shop, or she had no influence with him—his criticism and impatience grew sharper each week.

It bothered Dr. Kalmar more than he thought it should, and much more than Mrs. Kalmar wanted it to. She was a pleasant little woman who liked things as they were, which was why Dr. Kalmar had hesitated all this while to ask her to undergo a slight rephysical; he would have preferred her a little taller, more filled out, her slight wrinkles deleted and, while he was thinking about it, he wished she'd let him give her space-black hair instead of her indeterminately blondish mop. But he'd rather have her as she was than peevish, so he had never mentioned it.

"Don't let the boy upset you," she said. "It's only that he's so young and inexperienced. You can't expect him to adjust quickly to a new environment and a whole new medical orientation."

"But that's just what annoys me! Why, I used to hang onto every word of Dr. Lowell's when I came here! I never thought I knew better than he did."

"Well, dear, you're you and Dr. Lowell is Dr. Lowell and Dr. Hoyt is Dr. Hoyt."

He tried to think of an answer and couldn't. "I suppose so."

"Maybe you'd feel better if you spoke to Dr. Lowell about it."

"What could he do? This is really an internal problem that I should work out with Dr. Hoyt. I can't involve Dr. Lowell in it."

But it became intolerable when there was a young girl who wanted to be a boy and Dr. Kalmar and Dr. Hoyt got into the worst battle yet. Naturally, she had to be given an Ego Alter to make her happy about being a girl, whereas

Dr. Hoyt argued that she should be allowed to be a boy if that was what she wanted. Dr. Kalmar explained angrily once more that the sexes were closely balanced and Dr. Hoyt quoted the rule of personal choice. It was applicable on Earth, but not on Deneb, Dr. Kalmar retorted, to which Dr. Hoyt snorted something about playing God.

Dr. Kalmar confessed harshly to his wife that she was right. He had to bring old Dr. Lowell into the situation; it was out of Dr. Kalmar's control and was keeping the hospital in a turmoil. It was time for Dr. Lowell to inspect the hospital, the job he had taken in place of actual retirement. Dr. Kalmar needed help from Miss Dupont to bring the problem out into the open. But she became unexpectedly obstinate.

"I won't hurt Leo's career," she explained flatly.

Dr. Kalmar gave her a vacant look. "Leo?"

She blushed. "Dr. Hoyt. He's honestly trying to understand, but he finds it so different from Earth. Practically everything we do here is in reverse."

"But so is our environment, Miss Dupont. Earth is overcrowded and Deneb is under-populated, so of course our methods would be the opposite of Earth's. He has to be made to see that we must solve our problems our own way."

She studied his face suspiciously. "That's all you want?"

"Certainly. Damn it, do you think I want him fired and sent back to Earth before his internship's up? I know it would hurt his record. Besides, I need an assistant—but not one I have to bicker with every time I make a move."

"Well, in that case——"

"Good girl. All you have to do is help me hold off the cases he'd argue about until Dr. Lowell gets here." He stared down glumly at his hands, which were gripping each other tightly. "God knows I'm no diplomat. Dr. Lowell is. He convinced me easily enough when I came here. Maybe he can do the same with Dr. Hoyt."

"Oh, I hope he can," Miss Dupont said earnestly. "I want so much to have you and Leo work together in harmony."

He glanced up, curious. "Why?"

"Because I'm in love with him."

He found himself nodding bitterly. Having Dr. Hoyt go back to earth wouldn't be a fraction as bad as Miss Dupont leaving with him. So now there was something else to worry about.

Dr. Lowell came bouncing out of the jetcab a few days later. "The hospital better be spotless!" he called out jovially, paying off the hackie. "I'm in a mean mood. Liable to suspend everybody."

There was a strange lift to Dr. Kalmar's spirits as the old man entered the office. He wished without hope that he could inspire the same sort of reverence and respect. Impossible, of course. Dr. Lowell was great; he himself was nothing more than competent.

Dr. Kalmar introduced his young assistant to the old man.

"Young and strong," Dr. Lowell approved. "That's what we need on Deneb. Skill is important, but health and youth even more so."

"For those who stay," said Dr. Hoyt frostily. "I'm not."

Dr. Kalmar felt himself quiver with rage. The wet-nosed pup couldn't talk to Dr. Lowell like that!

But Dr. Lowell was saying cheerily, "You seem to have made up your mind to go back. No matter. Some decisions are like eggshells—made only to be broken. I hope that's what you'll do with yours."

"Not a chance," Dr. Hoyt said. He didn't take the arrogant expression off his face even when Miss Dupont looked at him pleadingly.

"Then I say let's signal the next ship——" Dr. Kalmar began.

Dr. Lowell cut in quickly, "You two have patients to attend to, I see. Don't worry about me. I know my way around this poor little wretch of a building. Not much like Earth hospitals, it is?" He headed for the medical supply room, adding just before he went in, "A lot can be said for small installations. The personal touch, you know."

Dr. Kalmar enviously realised how deftly the old man had put the youngster in his place, whereas he would have stood there and slugged it out verbally. Lord, if he could only acquire that awesome wisdom!

"Well, back to work," he said, trying to imitate the cheeriness at least.

"Sure, let's ruin some more lives," Dr. Hoyt almost snarled.

"Leo, *please!*" whispered Miss Dupont imploringly.

Five minutes later the two doctors were furiously arguing over a very old man who had been sent in by Social Control to have his eyesight strengthened.

"You have no right to let anybody dodder around like this!" Dr. Hoyt yelled. "What in hell is Rephysical for if not for such cases?"

"You probably think we ought to make him look like twenty-five again," Dr. Kalmar yelled back. "If that's all you've learned working here——"

"Now, now," said Dr. Lowell soothingly. He'd come in unnoticed by either of the men. "Dr. Hoyt is right, of course. We *would* like to make old people young and some day we'll be able to afford it. But not for some time to come."

"Why not?" Dr. Hoyt demanded in a lower tone, visibly flattered by Dr. Lowell's seemingly taking his side.

"Rephysical can't actually make anyone young. It can only give the outward appearance of youth and replace obviously diseased parts. But an old body is an old organism; it has to break down eventually. If we give it more vigour than it can endure, it breaks down too soon, much sooner than if we let it age normally. That represents economic loss as well as a humanitarian one."

"I don't follow you," Dr. Hoyt said bewilderedly.

"Well, our patient used to be a machinist. A good one. Now he's only able to be an oiler. A good one, too, when you improve his eyesight. He can go on doing that for years, performing a useful function. But he'd wear himself out in no time as a machinist again if you de-aged him."

"Is that supposed to make sense?"

"It does," said Dr. Lowell, "for Deneb."

Dr. Hoyt wanted to continue the discussion, but Dr. Lowell was already on his way to inspect another part of the hospital. Grumbling, the young man helped chart the

optical nerves that had to be replaced and measure the new curve of the retinas ordered by Social Control.

But he fought just as strenuously over other cases, especially a retired freight-jet pilot who had to have his reflexes slowed down so he could become a contented meteorologist. Whenever there was a loud disagreement of this sort, Dr. Lowell was there to mediate calmly.

At the end of the day, Dr. Kalmar was emotionally exhausted. He said as he and Dr. Lowell were washing up, "The kid's hopeless. I thought you could straighten him out—God knows I couldn't—but he'll never see why we have to work the way we do."

"What do you suggest?" Dr. Lowell asked through a towel.

"Send him back to Earth. Get an interne who's more malleable."

Dr. Lowell tossed the towel into the steriliser. "Can't be done. We're expanding so fast all over the Galaxy that Earth can't train and ship out enough doctors for the new colonies. If we sent him back, I don't know when we'd get another."

Dr. Kalmar swallowed. "You mean it's him or nobody?"

"Afraid so."

"But he'll never fit in on Deneb!"

"You did," Dr. Lowell said.

Dr. Kalmar tried to smile modestly. "I realised immediately how little I knew and how much more experience you had. I was willing to learn. Why, I used to listen to you and watch you work and try to see your reasons for doing things——"

"You think so?" asked Dr. Lowell.

Dr. Kalmar glanced at him in astonishment. "You know I did. I still do, for that matter."

"When you landed on Deneb," said Dr. Lowell, "you were the most stubborn, opinionated young ass I'd ever met."

Dr. Kalmar's smile became an appreciative grin. "Damn, I wish I had that light touch of yours!"

"You were so dogmatic and argumentative that Dr. Hoyt is a suggestible schoolboy in comparison."

"Well, you don't have to go that far," Dr. Kalmar said. "I get what you're driving at—every interne needs orientation and I should be more patient and understanding."

"Then you don't follow me at all," stated Dr. Lowell. "Invite Dr. Hoyt, Miss Dupont and me to your house for dinner to-night and maybe you'll get a better idea of what I mean."

"Anything for a free meal, eh?"

"And to keep a doctor here on Deneb that we'd lose otherwise."

"Implying that I can't do it."

"Isn't that the decision you'd come to?"

"Yes, I guess it is," Dr. Kalmar confessed. "All right, how about dinner at my house to-night? I'll round up the other two and call Harriet so she'll expect us."

"Delighted to come," said Dr. Lowell. "Nice of you to ask me."

Miss Dupont was elated at the invitation and Dr. Hoyt said he had nothing else to do anyway. On the videophone Mrs. Kalmar was dismayed for a moment, until Dr. Lowell told her to put through an emergency order to Central Commissary and he'd verify it.

That was when Dr. Kalmar realised how serious the old man was. On a raw planet where crises were everyday routine, a situation had to be catastrophic before it could be called an emergency.

Dinner on Deneb was the same as anywhere else in the Galaxy. To free women for other work, food was delivered weekly in cooked form. A special messenger from Central Commissary had brought the emergency rations and Mrs. Kalmar had simply punctured the self-heat cartridges and put the servings in front of each guest; the containers were disposable plates and came with single-use plastic utensils. No garbage, no preparation, no cleaning up afterwards, except to toss them all into the converter furnace. Dr. Hoyt was still not accustomed to wholly grown foods; he'd been

raised on synthetics, of course, which were the staples on Earth.

"Well, that was good," said Dr. Lowell, getting up from the table with his round little belly comfortably expanded. "Now, let's have a few drinks before we start a professional bull session. Where do you keep your liquor? I'd like to mix my special so Dr. Hoyt can see we colonials are not so provincial."

"Good Lord, I haven't had your special for years!" exclaimed Dr. Kalmar. "Since about the time I came to Deneb, in fact."

"That's why it's a special. Reserved for state occasions, such as arrivals of colleagues from our dear old home planet."

"Oh, you don't have to go to all that bother," said Dr. Hoyt. "You'd have to make it twice—once now and once when I leave."

"That won't be for quite a while, will it?" Miss Dupont asked anxiously.

"As soon as I finish my internship. No more alien worlds for me. I like Earth."

Mrs. Kalmar got him to talk about it, which was much easier than getting him to stop, while Dr. Kalmar showed the old man where the liquor stock and fixings were kept. Watching him mix the ingredients with a chemist's care, Dr. Kalmar felt a glow of nostalgia. He recalled the celebration at Dr. Lowell's house, several months after he had come from Earth, when he'd enjoyed himself so much that he'd passed out. It was one of the pleasanter memories of his start on Deneb.

"Can't mix them all in a single batch," Dr. Lowell explained, bringing the drinks over one at a time as he finished preparing them. "Mrs. Kalmar . . . Miss Dupont . . . our gracious host, Dr. Kalmar . . . and now Dr. Hoyt and myself." He lifted his glass at Dr. Hoyt. "Welcome to our latest associate—product, like ourselves, of the great medical schools of Earth. It's a forlorn hope, but may he learn as much from us about our peculiar methods as we learn from him about the latest terrestrial advances."

Dr. Hoyt, smiling as if he didn't think it possible, stood

up when they'd downed their toast to him. "To Earth," he said. "May I get back in record time." He gulped it, said, "Delicious—for a colonial drink," and froze with his smile as fixed as if it had been painted on.

"Leo!" Miss Dupont cried, and shook him, but he stayed frozen.

"The man's allergic to alcohol!" said Dr. Kalmar, astonished.

"Do something!" Mrs. Kalmar begged. "Don't let him stand there like that! He—he looks like a petrified man!"

"Don't get panicky," said Dr. Lowell in a quiet, confident voice. "That's when you passed out, Dr. Kalmar. Right after your first taste of my special."

"But *we* haven't," Dr. Kalmar objected.

"Naturally. Your drinks weren't drugged."

"Drugged?" shrieked Miss Dupont. "You doped him?"

"That's rather obvious, isn't it?"

"But—what for?" Dr. Kalmar stammered.

"Same reason I slipped you a mickey not long after you got here. We can't take any chances that he'll ship back to Earth. You see?"

"I don't," raged Miss Dupont. "I think it's a cheap, dirty, foul trick and it won't work, either. You can't *keep* him drugged."

"I don't like you talking to Dr. Lowell like that," said Dr. Kalmar indignantly.

"You should be the last one to object," Mrs. Kalmar pointed out. "He said he drugged you, too."

"I know," Dr. Kalmar said blankly. "I don't understand—"

"You will," promised Dr. Lowell. "Just come along and don't interfere. Better give him the order; it'll keep things straighter."

Mrs. Kalmar was grimly disapproving and Miss Dupont was close to hysteria. Only Dr. Kalmar retained his awed respect for Dr. Lowell. If the old man said it was all right, it was, even if he couldn't see the reason.

"Go ahead," urged Dr. Lowell.

"Dr. Hoyt!"

"Yes, Dr. Kalmar?"

"You will come with us!"

"Yes, Dr. Kalmar."

Dr. Lowell took them back to the hospital.

"Now what?" asked Dr. Kalmar.

"You actually don't know?" Miss Dupont demanded.

"He wants to put Leo through the Ego Alter."

"That's absurd," Dr. Kalmar said angrily, "and an outright slander. Dr. Lowell wouldn't consider such a thing—the boy didn't ask for it and it wasn't authorised by Social Control."

Dr. Lowell smiled genially and opened the door to the Ego Alter room. "I hate to disillusion you, Dr. Kalmar. That's exactly what I have in mind—the same thing I did to you."

"That's absurd," Dr. Kalmar repeated, but with less conviction and more confusion than before.

"It worked. Tell him to sit down."

Dr. Kalmar did, and automatically fitted the wired plastic helmet to Dr. Hoyt's head.

"You can't!" cried Miss Dupont as he reached for the dials on the control console. "It's not fair!"

"Let's not get involved in a discussion on ethics," Dr. Lowell said. "Deneb can't afford to lose him; we need every doctor we have. If he goes back to Earth, it may be years before we get a replacement."

"But you can't do it without his consent!"

"There's time for that later," the old man grinned. "Keep his eyes on you, Dr. Kalmar, while you build up his father image. Cut down on hostility, aggression and power drive. Boost social responsibility and adventurousness. But make sure he's looking at you constantly."

"I won't allow it," said Mrs. Kalmar flatly. "You won't make my husband violate his oath."

"I did it to him, didn't I?" Dr. Lowell replied jovially. "It got you a husband."

Miss Dupont grabbed at Dr. Kalmar's hand, but he had already turned on the current.

"Anything else?" he asked.

"Well, he has to get married, of course," Dr. Lowell said.

"Let him look at Miss Dupont—she's scheduled for this

year, isn't she?—while you give him a shot of mating urge. Now, wipe out the memory of this incident and put him on a joy jag. We can validate that by liquoring him up afterward. When you're finished, bring him to."

Dr. Hoyt came out of it almost with a whoop. He lurched out of the insulated seat, stared at Miss Dupont for a moment with eyes that almost glittered, and seized and kissed her.

"My goodness!" she gasped.

"Now, what were you saying about ethics?" Dr. Lowell asked.

There was no answer. Both Miss Dupont and Mrs. Kalmar had frozen.

"You drugged them, too?" Dr. Kalmar weakly wanted to know.

"A bit slower-acting," admitted the old man. "All you have to do with them is wipe out the last half hour. Don't want any witnesses to an unethical act, you know. Oh, and put them on a jag also."

Dr. Kalmar followed instructions.

Finished, they left the three uproariously drunk in the waiting room and went to wash up. Dr. Kalmar went along bewilderedly. The old man was as unconcerned as if he did this sort of thing daily.

"I was as arrogant and belligerent as this squirt was?"

"Worse," Dr. Lowell said. "He was willing to finish out his internship. You weren't. Still worried about the ethics?"

"Yes. Naturally."

"All right, apply some logic, then. Are you happier on Deneb than you'd have been on Earth?"

"Well, certainly. I'd have been lucky to get a job doctoring in a summer camp. I wouldn't trade a roomy planet like this for the jammed cubicles of Earth. And I like our methods better than terrestrial dogma. But those are my preferences. I can't inflict them on anybody else."

"The hell they were your preferences. You bickered more about our methods and longed more loudly for the tenements of Earth than this lad ever did. All it took was a

slight Ego Alter and you have a happier life than you would have had. Right?"

Dr. Kalmar felt his tension ease. If the old man said it was right, it was. He became momentarily resentful when he realised that that reaction had been installed by Dr. Lowell, but then he smiled. It really was right. A bit arbitrary, perhaps, but for the good of Dr. Hoyt and Deneb in the long run, just as it had been for himself.

"Look," he said, drying his arms. "I've been wanting my wife to go through a slight rephysical."

"Why don't you ask her?"

"The fact is that I'm afraid she'll think I'm dissatisfied and I don't want her to get resentful."

"Maybe she'd like you to do some changing, too."

"What for? I'm all right."

"She probably feels the same way about herself."

"But all I want are a few changes in her. She's as high as a space pilot now. It would be a cinch to—"

Dr. Lowell flung down the towel and gave him an outraged glare. "There's such a thing as professional ethics, Dr. Kalmar!"

"But you—"

"That's different. It was a social decision, not a selfish one. If you ask her and she agrees, that's up to her. But you can't take advantage of her in an egocentric, arbitrary way. You just try it and I'll have you sent back to Earth."

Dr. Kalmar felt his knees grow weak in alarm. "No, no. It's not that important. Just an insignificant kind of wish."

And it was, he discovered when they went out to the waiting room. Unused to jags, Mrs. Kalmar was more affectionate than she'd been since they were first married; he'd have to remember to go on them periodically with her. Miss Dupont, unwilling to budge out of Dr. Hoyt's tight arms, had glassily joyous eyes. Dr. Hoyt didn't let her go until he caught sight of Dr. Kalmar.

"Greatest doctor I ever met," he said enthusiastically. "Won'ful planet, Deneb. Just wanna marry Miss Dupont, stay here and learn at your feet. Okay?"

Dr. Kalmar's glance at the old man was no less worshipful. "It couldn't be okayer," he said.

Book Reviews

FICTION



THEY SHALL HAVE STARS,
by James Blish; Faber & Faber,
24 Russell Square, London, W.C.1,
182 pp., 12s. 6d.

Those who have read *Earthman, Come Home*, by the same author, will know of the "spindizzies," the invention which has made it possible for cities to tour the galaxy. This book deals with the invention of the "spindizzy" and is a combination of power-politics and colossal experimentation.

Senator Wagoner, hounded down and boxed in by various committees and investigations, can foresee the end of space flight which has remained in stasis for too long. Of interstellar flight, there is no sign at all, despite the billions which have been poured into various projects run by orthodox scientists and overseered by "Security." To break the deadlock he engages in an "underground" war with constituted authority.

Into the resultant situation Colonel Paige Russell, spaceman, reports to Pfitzner & Sons, Inc., the big laboratories manufacturing antibiotics, with soil samples taken from the satellites of Jupiter. He finds that the laboratory is not quite all it purports to be, falls in love with Anne Abbott, falls foul of McNinery the power-mad political boss, makes some shrewd deductions and finally learns the amazing truth, both about the laboratories and the colossal Bridge on Jupiter.

The action, set alternately on Earth and at the scene of the Great Bridge, is fast and convincing. A really satisfying story told in an adult manner.

NOW TO THE STARS, by Captain W. E. Johns; Hodder & Stoughton, London, E.C.4, 190 pp., 7s. 6d.

This is a juvenile written by the famous author of the *Biggles* series and contains six colour plates. There is also a foreword in which the author admits that the terms star, planet, planetoid and asteroid have been somewhat loosely used for the purposes of "easy reading." Why this should be thought necessary is hard to understand. Would calling a jet plane a radial-engined prop-job be justified on those grounds?

The story itself concerns the further adventures of Professor Brance and his companions on a Grand Tour of the Asteroids (loosely called stars, planets, planetoids, etc.). Their adventures are reminiscent of the old days of magazine science fiction when anything could happen and usually did. Science simply does not exist, but its lack is made up by a succession of adventures which should delight the youngsters as they follow the path of Professor Brance, Mino, and his other companions around a Solar System which, unfortunately, exists only in the imagination of the author.

JULES VERNE, MASTER OF SCIENCE FICTION, by I. O. Evans; Sidgwick & Jackson Ltd., 1 Tavistock Chambers, Bloomsbury Way, London, W.C.1, 272 pp., 12s. 6d.

This book is not a biography of Jules Verne but a selection from his writings with a critical essay by the selector. Some data on the great man is given in the introduction, but the remaining 238 odd pages are given to excerpts from various stories thus qualifying the book for its "fiction" designation.

To comment on the writing of Jules Verne is now superfluous. As I. O. Evans admits, his writing is not good by modern standards and, in the light of present-day knowledge, his science is worse. But to enjoy Verne it would be wrong to measure him against present-day writers. His position as

"father" of science fiction, which he shares with Poe and Wells, is secure, and a recent film, far from vulgarising his better-known story, has done much to bring him to the attention of a new generation. This book, in a way, is a digest of his stories. If you know the writings of Jules Verne it will have a special appeal for you. If you have heard of him and want to find out more, this book is an easy way to do it.

NON-FICTION

GUIDE TO THE HEAVENS, by H. P. Wilkins, F.R.A.S.; Frederick Muller Ltd., 110 Fleet Street, London, E.C.4, 108 pp., 12s. 6d.

This is a pictorial guide to the wonders of the sky for everyone who wants to know more about the universe in which they live, but has no instrument or, at the most, a modest binocular. As a guide to the fledging astronomer, it is invaluable with its star maps and other illustrations. Books such as these teach astronomy the "easy" way, and will be greatly acceptable to any who have ever looked at the night sky and wished they knew a little more about what they see.

THE COAST OF CORAL, by Arthur C. Clarke; Frederick Muller Ltd., 206 pp., 21s.

This book is an introduction to an alien world; one which laps the shores of every country in the world. The author takes us to Australia, to the Great Barrier Reef, and with him we explore the fantastic world beneath the waves. Coupled with accounts of diving are personal adventures, much background material dealing with the pearling industry and fascinating sidelights on the strange creatures to be found on the 1,500 miles of living coral which is the Great Barrier Reef.

One of the best parts of the book are the photographic illustrations, 16 in colour and 58 in black and white, and all are of a standard to make the average photographer bite his nails in envy, the underwater photographs being particularly excellent.

Discussions

CALLING MR. SHARMA!

I have just enjoyed reading No. 71—that is all except the last letter. In this, Mr. Sharma asserts that atoms must be ionised before they will take place in a chemical reaction. The first reaction quoted: $H + H \rightarrow H_2$ is nothing unusual whereas the second is. The combination of hydrogen atoms (not ions) is a typical example of all gaseous reactions and many reactors in solution.

All proceed via uncharged atoms on incomplete molecules, both being covered by the generic name of "free radicals." By an incomplete molecule I mean something of the type CH_3 , a methane molecule minus a hydrogen atom, electrons and all, leaving an uncharged though very reactive entity. At least four methods of detecting free radicals are in use.

Mr. Sharma appears to have fallen into the common error of believing that the usual stoichiometric equation for a chemical reaction actually represents what happens. This only occurs in a few cases and the only five termolecular reactions involve nitric oxide. This includes Mr. Sharma's typical reaction.

It is well established that reactions of the $A + A \rightarrow A_2$ type normally have termolecular kinetics whilst reactions of the type $A + B + C \rightarrow E + F$ —have much more complicated kinetics, often involving fractional powers.

The stoichiometric equation

only tells you that, if you start with what is on the left-hand side of the equation you will get, mostly, what is on the right-hand side of the equation—it tells you nothing about the course of the equation. For example take $2H_2 + O_2 \rightarrow 2H_2O$.

This appears nice and straightforward but, in fact, involves at least six individual reactions following in a chain, the relative importance of the steps depending on the reaction conditions. Another example $H + H \rightarrow H_2$.

This reaction has termolecular kinetics and not the expected bimolecular ones. The third atom comes in as the wall of the vessel on some non-reacting species present in the gas phase; e.g., water vapour.

One point re sonic reactions. Is the reaction step; $Fe^{3+} + 3Cl^- \rightarrow FeCl_3$ likely to be bimolecular?

For anyone wanting to follow up the above I suggest a look at *The Kinetics of Chemical Change*, by Sir C. N. Hinshelwood, and *The Chemistry of Free Radicals* by W. A. Waters.

In conclusion, may I suggest that the error in No. 68 is non-existent, and make the old plea that the "science" in SF should be a reasonable extrapolation of current knowledge and not completely divorced from reality.

C. W. Platten, B.Sc.,
10 Mount Preston, Leeds 2.

Just to keep things straight. Mr. Sharma did not state that all

atoms must be ionised before chemical reactions can take place. In fact, he objected to the statement, and his examples were in defence of his objection.

FLYING SAUCERS

Being an ordinary straight-thinking reader of science fiction and facts, I would like to know if any readers have ever discussed the following. According to the *The Nature of the Universe*, by Hoyle, and all mags, books and reports that I have read about "flying saucers," is it not possible that (according to Fred Hoyle all galaxies die slowly as they drift outwards into space) there must be some other, far more advanced race from some dying galaxy who have conquered both space travel and inter-galactic travel by necessity?

Would the people of Earth stay here if the world was dying? I for one would willingly live out my life on board a fully-equipped spaceship in preference, if necessary heading for Andromeda or M81 in Ursa Major. Maybe the people of Earth originally were colonists; e.g., the Egyptians? Records could have been lost during the Deluge and reports of "flying saucers" date back to these periods. Where is Atlantis?

Anyhow, look back at the available records of fact and see what I mean. In which case, there are many more races throughout the galaxy with space travel behind them.

Mr. B. Crocker should read the books on Flying Saucers to get the Magnetic Theory. I should say that supra-light velocities are quite in order—to the people in the spaceship, but they'd be

invisible to anything else not travelling at their speed or near it.

Some readers are inclined to ask: "Why haven't these other races contacted us?" I just say: "Why should they?" Would you try to talk to a tribe of cannibals in deep Africa? Or would you just hop into your helicopter and get out while your skin's still whole? There is plenty of room for exploration of peaceful planets when your home is a spaceship. E. F. Morgan, Ramgatana Road, Ohakume, North Island, New Zealand.

Folk tales, legends, visions and mythologies are not facts and it is wrong to assume that they are. As yet, we have no proof that the galaxy contains any other intelligent race. The system of "proving" that there are—e.g., "If it isn't that, then what is it?"—is scientifically invalid. Defying anyone to prove that a dogmatic statement is wrong is not proof of the truth of the dogmatic statement. It merely throws the burden of proof onto someone else. As for supra-light velocities, you have raised an interesting point. If a spaceship travelled to Alpha Centauri at the speed of light it would need approximately eight years for the double journey. Eight years to observers on Earth, that is. But to the crew of the vessel the journey would not appear to have taken so long. Would they have been travelling faster than light?

BLEATHERING?

I'd like to tackle you on your editorials. The one in No. 69, on Old Age—not the study of old age—was interesting, but it seems to me that you are using a form of

twisted deduction to prove an unprovable fact. Because you see two items, Old Age and Vegetarianism, you add them together and make a fact. What, by the way, do you call vegetarianism? No eggs, milk or fish? Or just not eating the flesh of animals? It would be extremely difficult to exist for centuries on a diet of berries, roots, leaves and fruits. Cereals would give a certain amount of protein and so would nuts. But nuts cannot very easily be preserved for a whole year and immense areas would be needed to supply a year's cereal crop.

There is a point which hardly helps to support your theory. At one time the human body possessed a usable appendix of a size suitable for dealing with a solely vegetarian diet. But the metamorphosis from an enormous appendix to a vestigial item which now causes more trouble than help could not be obtained in only 6,000 years of evolution.

And why 6,000 years? Because there is a calendar which gives the date of Adam's death as somewhere in the 3,000's B.C. and then runs down the historical data given in the Bible, clearly showing that the history of the Old Testament was no more than 4,000 years in length. Having that, and even having admitted that Methuselah lived more than 900 years, we are down to about 2,000 B.C.—when we know that the Egyptians were living on meats and other items. And not living for anywhere near 900 years—or even 500 if it comes to that.

The Biblical books—first written in Aramic—have been trans-

lated many times. From Aramic into Hebrew, thence to Greek, then Latin, then from Latin into English, and an archaic English at that. Faults must have crept in. Has it occurred to you that if "seasons" or "quarters" were substituted for "years" you could logically have a child fathered at the right time and Methuselah dying at about 200 years of age?

Are life assurance companies offering lower premiums to vegetarians because they live longer? Let me disabuse you of that theory right away. The reason is that, when people are getting old and they are not vegetarians, the eating of meat contributes to various heart diseases. Remember that people with high blood pressure are advised to leave meat alone. Just one of those simple answers.

As for No. 71, on Clairvoyance, you're blethering again. Taking your suggestion that a general sees his troops fighting and losing. You have forgotten that, most likely, in that *clair vu* he has seen his troops losing when *he has not been clairvoyant*. Having been clairvoyant this time he can now plan to win. This brings us to versions of "variable future"—in other words what he sees is the future most likely to happen, not the only future.

At the end of your editorial you state that work, hope and dreams have lifted man from the slime. But how do you know that dreams are not clairvoyancy? Clairvoyancy may only be another science that we have not yet solved. Had you lived a hundred years ago, would you have believed that man could talk across an ocean? And would you

have believed that an atom could be split and that so tiny a thing could blast so large an area?

Because the science of these things was gradually discovered, man now has the benefit of radio and atomic power. Clairvoyancy may add immeasurably to man's power for good; it may also, because man will not know how to use it, do untold harm.

Triona Law,
7 Inchmery Road, London, S.E.6.

A true vegetarian is someone who eats only vegetable matter. An elephant is a vegetarian—would you say that he can't exist? As for the appendix, isn't that proof that, at one time, men were able to subsist on a purely vegetarian diet? Nature does not usually equip animals with organs they do not or will not use. Your calendar could be wrong, couldn't it? And, personally, I feel that even 200 years is quite an advantage over three score and ten. As for life assurance companies offering lower premiums to vegetarians; if meat contributes to various heart troubles, thus accelerating death, isn't that proof of the advantage of being a vegetarian? And the insurance company's acceptance of that fact? Longer life, no matter how acquired, is still longer life.

One thing intrigues me—how can a man see into the future without being clairvoyant?

GREY LENS MAN

For fifteen years I've been an avid reader of science fiction. Due to my profession, which may put me miles and weeks away from magazine mail, I've more or less bought up big supplies where I could find any SF. This, of course,

makes me a little frustrated sometimes when I can't get the last one or two parts of a serial, but I have found that prowling through funny little bookshops, one in Hong Kong for instance, sometimes even these turn up.

There is one frustration that I have never yet been able to overcome, however. When I was a boy of fourteen I was so interested in one story that I committed the cardinal sin of reading it in the classroom with the obvious result that I was caught and the magazine confiscated.

The story was, I think, *Grey Lensman*, or anyhow one of the *Lensman* stories, and reading your issue No. 66 I noticed a review of *First Lensman*.

As you say, when the *Lensman* stories were first published they were regarded as the ultimate of their type and though tastes have changed, or rather, though science fiction writing has become more sophisticated, this story has stuck in my mind and I wish I could finish the complete story.

Could you advise me where I might obtain preferably the old magazines in which this story was published or the appropriate book or books to order, and from which publisher?

R. E. Hinch,
18 Pleasant Avenue,
East Lindfield, Sydney, N.S.W.,
Australia.

Grey Lensman first appeared in Astounding Science Fiction as a four-part serial, running from October, 1939. Messrs. T. V. Boardman may be publishing it as part of the Lensman series; or try science fiction book dealer for copy of American edition.

sfbc - 21

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by Olaf Stapledon (out of print)

TOMORROW SOMETIMES

COMES by F. G. Rayer

MINIMUM MAN

by Andrew Marvell

NO PLACE LIKE EARTH

edited by John Carnell

I, ROBOT

by Isaac Asimov

THE VOYAGE OF THE SPACE

BEAGLE by A. E. Van Vogt

PLAYER PIANO

by Kurt Vonnegut

ODD JOHN

by Olaf Stapledon

THE DEMOLISHED MAN

by Alfred Bester

GREAT STORIES OF SCIENCE FICTION

edited by Murray Leinster

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by John Wyndham

FAHRENHEIT 451

by Ray Bradbury

CHILDHOOD'S END

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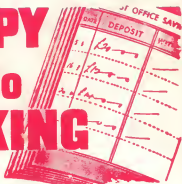
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